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ROYAL COMMISSION

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AGRICULTURE IN INDIA

Volume X

EVIDENCE

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CENTRAL PUBLICATION BRANCH
1927

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INTERIM REPORT.

To

THE KING'S MOST EXCELLENT MAJESTY.

May It Please Your Majesty,

We, the Commissioners appointed to examine and report on the present conditions of agricultural and rural economy in British India, and to make recommendations for the improvement of agriculture and to promote the welfare and prosperity of the rural population; in particular, to investigate:—(*a*) the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new and better crops and for improvement in agricultural practice, dairy farming and the breeding of stock; (*b*) the existing methods of transport and marketing of agricultural produce and stock; (*c*) the methods by which agricultural operations are financed and credit afforded to agriculturists; (*d*) the main factors affecting rural prosperity and the welfare of the agricultural population; and to make recommendations; availing ourselves of Your Majesty's permission to report our proceedings from time to time, desire to submit to Your Majesty the minutes of the evidence which we have taken in England on the subject of our Inquiry.

All of which we most humbly submit for Your Majesty's most gracious consideration.

(Signed) LINLITHGOW,
Chairman.
(„) H. S. LAWRENCE.
(„) T. H. MIDDLETON.
(„) J. MACKENNA.
(„) H. CALVERT.
(„) N. GANGULEE.
(„) L. K. HYDER.
(„) B. S. KAMAT.

(Signed) J. A. MADAN,
(„) F. W. H. SMITH,
Joint Secretaries.

16*th August*, 1927.

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CONTENTS.

		PAGE
TERMS OF REFERENCE		iii
QUESTIONNAIRE		iv-xiii
EVIDENCE OF—		
1	Sir FRANCIS L. C. FLOUD, K.C.B.	1–20
2	Mr. T. JONES	20–25
3	Sir JOHN MACFADYEAN, M.D., B.Sc., M.R.C.V.S., LL.D. ...	25–40
4	Sir PATRICK FAGAN, K.C.I.E., C.S.I.	41–87
5	Sir DANIEL HALL, K.C.B., M.A., F.R.S.	87–103
6	Mr. H. FABER	104–124
7	Dr. J. B. ORR, D.S.O., M.C., F.R.S.E.	124–136
8	Major WALTER ELLIOTT, M.P., M.C., D.Sc.	136–145
9	Dr. E. J. BUTLER, C.I.E., D.Sc., M.B., F.R.S.	146–167
10	Professor W. G. S. ADAMS, M.A.	167–174
11	Mr. ALBERT HOWARD, C.I.E., M.A.	174–200
12	Sir GILBERT WALKER, C.S.I., M.A., Sc.D., F.R.S.	201–208
13	Mr. H. A. F. LINDSAY, C.I.E., C.B.E., I.C.S.	208–232
14	Professor E. SHEARER, M.A., B.Sc.	232–257
15	Sir STEPHEN DEMETRIADI, K.B.E.	258–279
16	Mr. H. F. PFISTER	
17	Mr. C. H. TAYLOR	
18	Mr. L. WILLSON	
19	Mr. E. STEINER	280–295
20	Mr. J. E. FROST...	295–302
21	Mr. ALFRED WIGGLESWORTH	302–319
22	Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S.	
23	Captain S. E. J. BRADY, M.B.E.	
24	Mr. E. J. W. BUCKPITT, J.P.	
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26	Dr. E. J. GOULDING, D.Sc., F.I.C.	
27	Mr. J. SWAN	320–333
28	Mr. D. A. ANDERSON	333–348
29	Mr. G. ERSKINE SCOTT	
30	Colonel G. A. MALCOLM, D.S.O.	349–364
31	Mr. E. HENRY	
32	Mr. JAMES LITTLEWOOD	364–373
33	Sir HERBERT ROBSON, K.B.E.	374–387
34	Mr. L. T. CARMICHAEL	388–400
35	Major NORMAN MCLEOD	
36	Sir DAVID CHADWICK, C.S.I., C.I.E.	401–420
37	The Right Hon. W. G. A. ORMSBY GORE, M.P.	420–436
38	Mr. JASPER KNIGHT	437–446

EVIDENCE OF—*continued.*	PAGE.
39 Mr. G. E. ROWLAND	446–471
40 Mr. J. A. GOODWYN	
41 Mr. F. C. O. SPEYER	471–502
42 Lieut.-Gen. Sir WILLIAM FURSE, K.C.B., D.S.O.	503–528
43 Lieut.-Col. Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S. ...	
44 Mr. W. A. WILSON	529–543
45 Mr. A. E. JARRETT	543–553
46 Sir FREDERICK GEBBIE, Kt., C.I.E.	554–569
47 Sir THOMAS WARD, Kt., C.I.E., M.V.O.	
48 Mr. G. F. KEATINGE, C.I.E., I.C.S. (retired)...	569–582
49 Mr. V. A. GRANTHAM	582–599
50 Mr. VAUGHAN NASH, C.B., C.V.O.	600–623
51 Mr. E. GODFREY PELLY	624–633
52 Mr. G. A. JULIUS	633–671
53 Rev. Dr. E. M. MACPHAIL, C.I.E., C.B.E.	671–675
54 Professor T. B. WOOD, C.B.E., M.A.	676–702
55 Mr. F. L. ENGLEDOW, M.A.	
56 Sir ROWLAND BIFFEN, Kt., M.A., F.R.S.	702–709
57 Professor J. O. S. BUXTON, M.A., F.R.C.V.S.	710–716
58 Professor S. H. GAIGER, F.R.C.V.S.	717–732
59 Mr. EDWARD A. FOLEY, Ph.D.	733–746
60 Mr. C. D. GREENING	747–751
61 Dr. C. A. BARBER, C.I.E., Sc.D.	751–773
62 Sir JOHN RUSSELL...	774–800
63 Dr. B. A. KEEN, D.Sc., F.Inst.P.	801–804
APPENDICES	805–815
INDEX	i–lxxxv
GLOSSARY...	lxxxvi–lxxxvii

TERMS OF REFERENCE

Generally,

To examine and report on the present conditions of agriculture and rural economy in British India and to make recommendations for the improvement of agriculture and the promotion of the welfare and prosperity of the rural population;

In particular to investigate—

(*a*) the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new and better crops and for improvement in agricultural practice, dairy farming and the breeding of stock;

(*b*) the existing methods of transport and marketing of agricultural produce and stock;

(*c*) the methods by which agricultural operations are financed and credit afforded to agriculturists;

(*d*) the main factors affecting rural prosperity and the welfare of the agricultural population;

and to make recommendations.

It will not be within the scope of the Commission's duties to make recommendations regarding the existing system of landownership and tenancy or of the assessment of land revenue and irrigation charges, or the existing division of functions between the Government of India and the local Governments. But the Commission shall be at liberty to suggest means whereby the activities of the Governments in India may best be co-ordinated and to indicate directions in which the Government of India may usefully supplement the activities of local Governments.

MO Y 209—*a*

QUESTIONNAIRE

Part I

Question.

1. Research.
2. Agricultural Education.
3. Demonstration and Propaganda.
4. Administration.
5. Finance.
6. Agricultural Indebtedness.
7. Fragmentation of Holdings.

Part II

8. Irrigation.
9. Soils.
10. Fertilisers.
11. Crops.
12. Cultivation.
13. Crop Protection.
14. Implements.

Part III

15. Veterinary.
16. Animal Husbandry.

Part IV

17. Agricultural Industries.
18. Agricultural Labour.
19. Forests.
20. Marketing.
21. Tariffs and Sea Freights.
22. Co-operation.
23. General Education.
24. Attracting Capital.
25. Welfare of Rural Population.
26. Statistics.

QUESTIONNAIRE

PART I

1. Research.

(*a*) Have you suggestions to advance for the better organisation, administration and financing of—

(*i*) All research affecting the welfare of the agriculturist, including research into the scientific value of the indigenous theory and traditional methods of agriculture,

(*ii*) Veterinary research ?

(*b*) If in cases known to you progress is not being made because of the want of skilled workers, or field or laboratory facilities for study or by reason of any other handicaps, please give particulars. [Suggestions of a general kind should be made under (*a*) ; answers under this heading should relate to specific subjects. The purpose is to secure a list of the problems met with by scientific investigators in the course of their work which are being held over because of lack of resources or deficient organisation.]

(*c*) Can you suggest any particular subject for research not at present being investigated to which attention might usefully be turned ?

2. Agricultural Education.

With reference to any form of agricultural education of which you may have experience, please state your views on the following :—

(*i*) Is the supply of teachers and institutions sufficient ?

(*ii*) Is there an urgent need for extension of teaching facilities in any district or districts known to you personally ?

(*iii*) Should teachers in rural areas be drawn from the agricultural classes ?

(*iv*) Are the attendances at existing institutions as numerous as you would expect in present circumstances ; if not, state reasons. Can you suggest measures likely to stimulate the demand for instruction ?

(*v*) What are the main incentives which induce lads to study agriculture ?

(*vi*) Are pupils mainly drawn from the agricultural classes ?

(*vii*) Are there any modifications in existing courses of study which appear to be called for ; if so, what are they ?

(*viii*) What are your views upon (*a*) nature study ; (*b*) school plots ; (*c*) school farms ?

(*ix*) What are the careers of the majority of students who have studied agriculture ?

(*x*) How can agriculture be made attractive to middle class youths ?

(*xi*) Are there recent movements for improving the technical knowledge of students who have studied agriculture ?

(*xii*) How can adult education in rural tracts be popularised ?

(*xiii*) In suggesting any scheme for better educational facilities in rural areas, please give your views for (*a*) its administration and (*b*) its finance.

3. Demonstration and Propaganda.

(*a*) What are the measures which in your view have been successful in influencing and improving the practice of cultivators ?

(*b*) Can you make suggestions for increasing the effectiveness of field demonstrations ?

(*c*) Can you suggest methods whereby cultivators may be induced to adopt expert advice ?

(*d*) If you are aware of any striking instances of the success or the failure of demonstration and propaganda work, please give particulars and indicate the reasons for success or for failure.

4. Administration.

(*a*) Do you wish to suggest means towards the better co-ordination of the activities of the Governments in India or to indicate directions in which the Government of India may usefully supplement the activities of the local Governments ?

(*b*) Is it your opinion that the expert scientific knowledge required in the development of agriculture in the different Provinces could be supplied to a greater extent than is the case at present by increasing the scientific staff of the Government of India ? If so, indicate the types of work which would benefit by pooling the services of experts, and suggest how that work should be controlled.

(*c*) Are you satisfied from the agricultural standpoint with the services afforded by—

(*i*) The Agricultural and Veterinary Services,

(*ii*) Railways and steamers,

(*iii*) Roads,

(*iv*) Meteorological Department,

(*v*) Posts, and

(*vi*) Telegraphs, including wireless ?

If not, please indicate directions in which you think these Services might be improved or extended.

5. Finance.

(*a*) What are your views as to the steps that should be taken for the better financing of agricultural operations and for the provision of short and long-term credit to cultivators ?

(*b*) Do you wish to suggest means whereby cultivators may be induced to make fuller use of the Government system of *taccavi* ?

6. Agricultural Indebtedness.

(*a*) What in your opinion are :—

(*i*) the main causes of borrowing,

(*ii*) the sources of credit, and

(*iii*) the reasons preventing repayment.

(*b*) What measures in your opinion are necessary for lightening agriculture's burden of debt ? For example, should special measures be taken to deal with rural insolvency, to enforce the application of the Usurious Loans Act, or to facilitate the redemption of mortgages ?

(*c*) Should measures be taken to restrict or control the credit of cultivators such as limiting the right of mortgage and sale ? Should non-terminable mortgages be prohibited ?

7. Fragmentation of Holdings.

(*a*) Do you wish to suggest means for reducing the loss in agricultural efficiency attendant upon the excessive subdivision of holdings ?

(*b*) What are the obstacles in the way of consolidation and how can they be overcome ?

(*c*) Do you consider legislation to be necessary to deal with minors, widows with life interest, persons legally incapable, alienation and dissentients, and to keep disputes out of the courts ?

PART II

8. Irrigation.

(*a*) Name any district or districts in which you advocate the adoption of new irrigation schemes, or suggest extensions or improvements in the existing systems or methods of irrigation by—

(*i*) Perennial and non-perennial canals,
(*ii*) Tanks and ponds,
(*iii*) Wells.

What are the obstacles in your district or Province to the extension of irrigation by each of the above methods ?

(*b*) Are you satisfied with the existing methods of distributing canal water to cultivators ? Describe the methods that have been employed to prevent wastage of water by evaporation and by absorption in the soil. What form of outlet for distribution to cultivators at the tail end do you regard as the most equitable and economical ? Have these methods and devices been successful, or do you wish to suggest improvements ?

(*N.B.*—Irrigation charges are *not* within the terms of reference of the Commission, and should not be commented upon.)

9. Soils.

(*a*) Have you suggestions to make—

(*i*) for the improvement of soils, whether by drainage or other means, not dealt with under other headings in this questionnaire.
(*ii*) for the reclamation of Alkali (Usar) or other uncultivable land,
(*iii*) for the prevention of the erosion of the surface soil by flood water ?

(*b*) Can you give instances of soils known to you which, within your recollection, have—

(*i*) undergone marked improvement,
(*ii*) suffered marked deterioration ?

If so, please give full particulars.

(*c*) What measures should Government take to encourage the reclamation of areas of cultivable land which have gone out of cultivation ?

10. Fertilisers.

(*a*) In your opinion, could greater use be profitably made of natural manures or artificial fertilisers ? If so, please indicate the directions in which you think improvement possible.

(*b*) Can you suggest measures to prevent the fraudulent adulteration of fertilisers ?

(*c*) What methods would you employ to popularise new and improved fertilisers ?

(*d*) Mention any localities known to you in which a considerable increase in the use of manures has recently taken place.

(*e*) Has effect of manuring with phosphates, nitrates, sulphate of ammonia, and potash manures been sufficiently investigated ? If so, what is the result of such investigation ?

(*f*) What methods would you employ to discourage the practice of using cowdung as fuel ?

11. Crops.

(*a*) Please give your views on—

(*i*) the improvement of existing crops,

(*ii*) the introduction of new crops including fodder crops,

(*iii*) the distribution of seeds,

(*iv*) the prevention of damage by wild animals.

(*b*) Can you suggest any heavy yielding food crops in replacement of the present crops ?

(*c*) Any successful efforts in improving crops or substituting more profitable crops which have come under your own observation should be mentioned.

12. Cultivation.

Can you suggest improvements in—

(*i*) the existing system of tillage, or

(*ii*) the customary rotations or mixtures of the more important crops ?

13. Crop Protection, Internal and External.

Please give your views on—

(*i*) The efficacy and sufficiency of existing measures for protection of crops from external infection, pests and diseases.

(*ii*) The desirability of adopting internal measures against infection.

14. Implements.

(*a*) Have you any suggestion for the improvement of existing, or the introduction of new, agricultural implements and machinery ?

(*b*) What steps do you think may usefully be taken to hasten the adoption by the cultivator of improved implements ?

(*c*) Are there any difficulties which manufacturers have to contend with in the production of agricultural implements or their distribution for sale throughout the country ? If so, can you suggest means by which these difficulties may be removed ?

PART III

15. Veterinary.

(*a*) Should the Civil Veterinary Department be under the Director of Agriculture or should it be independent ?

(*b*) (*i*) Are dispensaries under the control of Local (District) Boards ? Does this system work well ?

(*ii*) Is the need for expansion being adequately met ?

(*iii*) Would you advocate the transfer of control to Provincial authority ?

(*c*) (*i*) Do agriculturists make full use of the veterinary dispensaries ? If not, can you suggest improvements to remedy this ?

(*ii*) Is full use made of touring dispensaries ?

(*d*) What are the obstacles met with in dealing with contagious diseases ? Do you advocate legislation dealing with notification, segregation, disposal of diseased carcases, compulsory inoculation of contacts and prohibition of the movement of animals exposed to infection ? Failing legislation, can you suggest other means of improving existing conditions ?

(*e*) Is there any difficulty in securing sufficient serum to meet the demand ?

(*f*) What are the obstacles in the way of popularising preventive inoculation ? Is any fee charged, and, if so, does this act as a deterrent ?

(*g*) Do you consider that the provision of further facilities for research into animal disease is desirable ?

If so, do you advocate that such further facilities should take the form of—

(*i*) an extension of the Muktesar Institute, or

(*ii*) the setting up, or extension of, Provincial Veterinary Research Institutions ?

(*h*) Do you recommend that special investigations should be conducted by—

(*i*) officers of the Muktesar Institute, or

(*ii*) research officers in the Provinces ?

(*i*) Do you recommend the appointment of a Superior Veterinary Officer with the Government of India ? What advantages do you expect would result from such an appointment ?

16. Animal Husbandry.

(*a*) Do you wish to make suggestions for—

(*i*) improving the breeds of livestock,

(*ii*) the betterment of the dairying industry,

(*iii*) improving existing practice in animal husbandry?

(*b*) Comment on the following as causes of injury to cattle in your district—

(*i*) Overstocking of common pastures,

(*ii*) Absence of enclosed pastures, such as grass borders in tilled fields,

(*iii*) Insufficiency of dry fodder such as the straw of cereals or the stems and leaves of pulses,

(*iv*) Absence of green fodders in dry seasons,

(*v*) Absence of mineral constituents in fodder and feeding stuffs.

(*c*) Please mention the months of the year in which fodder shortage is most marked in your district. For how many weeks does scarcity of fodder usually exist ? After this period of scarcity ends how many weeks elapse before young growing cattle begin to thrive ?

(*d*) Can you suggest any practicable methods of improving or supplementing the fodder supply that would be applicable to your district ?

(*e*) How can landowners be induced to take a keener practical interest in these matters ?

PART IV

17. Agricultural Industries.

(*a*) Can you give any estimate of the number of days of work done by an average cultivator on his holding during the year ? What does he do in the slack season ?

(*b*) Can you suggest means for encouraging the adoption of subsidiary industries ? Can you suggest any new subsidiary industries to occupy the spare time of the family which could be established with Government aid ?

(*c*) What are the obstacles in the way of expansion of such industries as beekeeping, poultry rearing, fruit growing, sericulture, pisciculture, lac culture, rope making, basket making, etc. ?

(*d*) Do you think that Government should do more to establish industries connected with the preparation of agricultural produce for consumption, such as oil pressing, sugar making, cotton ginning, rice hulling, utilisation of wheat straw for card-board, utilisation of cotton seed for felt, fodder, oil and fuel, utilisation of rice straw for paper, etc. ?

(*e*) Could subsidiary employment be found by encouraging industrial concerns to move to rural areas ? Can you suggest methods ?

(*f*) Do you recommend a more intensive study of each rural industry in its technical, commercial and financial aspects, with a view to, among other things, introduction of improved tools and appliances ?

(*g*) Can you suggest any other measures which might lead to greater rural employment ?

(*h*) Can you suggest means whereby the people could be induced to devote their spare time to improving the health conditions of their own environment ?

18. Agricultural Labour.

(*a*) What measures, if any, should be taken to attract agricultural labour from areas in which there is a surplus to—

(*i*) areas under cultivation in which there is a shortage of such labour ? and

(*ii*) areas in which large tracts of cultivable land remain uncultivated ?

Please distinguish between suggestions designed to relieve seasonal unemployment and proposals for the permanent migration of agricultural population.

(*b*) If there is any shortage of agricultural labour in your Province, what are the causes thereof and how could they be removed ?

(*c*) Can you suggest measures designed to facilitate the occupation and development, by surplus agricultural labour, of areas not at present under cultivation ?

19. Forests.

(*a*) Do you consider that forest lands as such are at present being put to their fullest use for agricultural purposes ? For instance, are grazing facilities granted to the extent compatible with the proper preservation of forest areas ? If not, state the changes or developments in current practice which you consider advisable.

(*b*) Can you suggest means whereby the supply of firewood and fodder in rural areas may be increased ?

(*c*) Has deterioration of forests led to soil erosion ? What remedies would you suggest for erosion and damage from floods ?

(*d*) Can you indicate any methods by which supply of moisture in the soil, the rainfall and supply of canal water can be increased and regulated by afforestation or by the increased protection of forests so as to benefit agriculture ? Would the same methods be useful in preventing the destruction by erosion of agricultural land ?

(*e*) Is there an opening for schemes of afforestation in the neighbourhood of villages ?

(*f*) Are forests suffering deterioration from excessive grazing ? Is soil erosion being thereby facilitated ? Suggest remedies.

20. Marketing.

(*a*) Do you consider existing market facilities to be satisfactory ? Please specify and criticise the markets to which you refer, and make suggestions for their improvement.

(*b*) Are you satisfied with the existing system of marketing and distribution ? If not, please indicate the produce to which you refer and describe and criticise in detail the channels of marketing and distribution from the producer to the consumer in India (or exporter in the case of produce exported overseas). State the services rendered by each intermediary and whether such intermediary acts in the capacity of merchant or commission agent, and comment upon the efficiency of these services and the margins upon which such intermediaries operate. Please describe

the method by which each transaction is financed, or in the case of barter, by which an exchange is effected.

(*c*) Do you wish to suggest steps whereby the quality, purity, grading or packing of agricultural produce may be improved, distinguishing where possible between produce destined for—

(*i*) Indian markets ?

(*ii*) Export markets ?

(*d*) Do you think that more effective steps might be taken to place at the disposal of cultivators, merchants and traders information as to market conditions, whether Indian or overseas ; crop returns ; complaints as to Indian produce from wheresoever originating ; and agricultural and marketing news in general ?

21. Tariffs and Sea Freights.

Do existing (*a*) customs duties, both import and export, and (*b*) sea freights adversely affect the prosperity of the Indian cultivator ? If so, have you any recommendations to make ?

22. Co-operation.

(*a*) What steps do you think should be taken to encourage the growth of the co-operative movement—

(*i*) by Government,

(*ii*) by non-official agencies ?

(*b*) Have you any observations to make upon—

(*i*) Credit societies ;

(*ii*) Purchase societies ;

(*iii*) Societies formed for the sale of produce or stock ;

(*iv*) Societies for effecting improvements—*e.g.*, the digging of wells and the construction of bunds, walls and fences, or the planting of hedges ;

(*v*) Societies formed for the aggregation of fragmented holdings and their redistribution in plots of reasonable size ;

(*vi*) Societies for the co-operative use of agricultural machinery ;

(*vii*) Societies for joint farming ;

(*viii*) Cattle breeding societies ;

(*ix*) Societies formed for any purpose connected with agriculture or with the betterment of village life, but not specified above ?

(*c*) Where co-operative schemes for joint improvement, such as co-operative irrigation or co-operative fencing or a co-operative consolidation of holdings scheme, cannot be given effect to owing to the unwillingness of a small minority to join, do you think legislation should be introduced in order to compel such persons to join for the common benefit of all ?

(*d*) Do you consider that those societies of which you have personal knowledge have, in the main, achieved their object ?

23. General Education.

(*a*) Do you wish to make observations upon existing systems of education in their bearing upon the agricultural efficiency of the people ? If you make suggestions, please distinguish, as far as possible, between—

(*i*) Higher or collegiate,

(*ii*) Middle school, and

(*iii*) Elementary school education.

(*b*) (*i*) Can you suggest any methods whereby rural education may improve the ability and culture of agriculturists of all grades while retaining their interest in the land ?

(*ii*) What is your experience of compulsory education in rural areas ?

(*iii*) What is the explanation of the small proportion of boys in rural primary schools who pass through the fourth class ?

24. Attracting Capital.

(*a*) What steps are necessary in order to induce a larger number of men of capital and enterprise to take to agriculture ?

(*b*) What are the factors tending to discourage owners of agricultural land from carrying out improvements ?

25. Welfare of Rural Population.

(*a*) Outside the subjects enumerated above, have you any suggestions to offer for improving hygiene in rural areas and for the promotion of the general well-being and prosperity of the rural population ?

(*b*) Are you, for instance, in favour of Government conducting economic surveys in typical villages with a view to ascertaining the economic position of the cultivators ? If so, what, in your opinion, should be the scope and methods of such enquiries ?

(*c*) If you have carried out anything in the nature of such intensive enquiry, please state the broad conclusions which you reached.

26. Statistics.

(*a*) Do you wish to make suggestions for the extension or improvement of the existing methods of—

(*i*) ascertaining areas under cultivation and crops ;

(*ii*) estimating the yield of agricultural produce ;

(*iii*) enumerating livestock and implements ;

(*iv*) collecting information on land tenure, the incidence of land revenue and the size of the agricultural population ;

(*v*) arranging and publishing agricultural statistics ?

(*b*) Have you any other suggestions to make under this heading ?

ROYAL COMMISSION ON AGRICULTURE.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

ROYAL COMMISSION ON AGRICULTURE.

Monday, June 13th, 1927.

LONDON.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B,
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } (*Joint Secretaries.*)

Sir FRANCIS L. C. FLOUD, K.C.B., Permanent Secretary to the Ministry of Agriculture and Fisheries.

MEMORANDUM ON THE ORGANISATION OF THE MINISTRY OF AGRICULTURE AND FISHERIES.

The Ministry is organised in seven Divisions, in which are grouped the various branches of its work, and two other Divisions which carry out the general services of the Department in relation to Establishment and Finance. Six of the seven Divisions are in charge of an Assistant Secretary, and the other, which is concerned with Animal Diseases, is under the charge of the Chief Veterinary Officer, who is a professional Veterinary Surgeon. The Establishment Division is under the charge of a Principal Establishment Officer, and the Finance Division under a Principal Finance Officer. Each Head of a Division has under him one or more Branches under the charge, either of a Principal belonging to the administrative class of the Civil Service, or of a Senior Staff Officer. The heads of Branches are assisted by Assistant Principals, Staff Officers and Higher Grade Clerical Officers, who take charge of sections of the work. Several Divisions also have attached to them technical officers, some of whom are graded as Commissioners, and those Divisions, whose work requires the maintenance of

an outdoor staff, have a Chief Inspector who is responsible for the work and discipline of the inspectorate.

Each Head of a Division is responsible for all the work carried on in his Division, but in matters which raise questions of political or public importance he would refer the case to the Permanent Secretary for submission if necessary to the Minister. The volume and complexity of the work of the Ministry has however grown so great that it is impossible for any Permanent Secretary to control the work in detail, and each Assistant Secretary has direct access to the Minister if he so desires. Any matters involving questions of staff or finance have to be referred to the Establishment or Finance Division for examination before any action is taken.

As far as possible, personal consultation between the principal members of the staff has taken the place of writing long minutes to one another, and in order to keep the Minister and the Parliamentary Secretary informed of the current work of the Ministry, without troubling them to read a large number of official files, a monthly report is prepared, which is discussed by the Minister with the principal officers of the Department at a staff conference.

The Economics Division of the Ministry includes three Branches dealing respectively with Statistics, Labour and Marketing. The Statistical Branch is responsible for the collection and tabulation of the annual Agricultural Returns and the returns of Market Prices, and for the publication of the weekly Agricultural Market Report. It maintains a large staff of part-time Crop Reporters and Market Reporters all over the country. The Labour Branch deals with the administration and enforcement of the Agricultural Wages (Regulation) Act and any other labour questions. It employs a staff of Inspectors for the local investigation of complaints, &c. The Market Branch deals with the marketing of agricultural produce, with agricultural credit and co-operation, and it also is responsible for the administration of the British Sugar (Subsidy) Act. A small staff of Market Investigators is attached to this Branch.

The Diseases of Animals Division is responsible for all measures for the control, treatment and eradication of animal diseases, and it deals with questions relating to the importation of animals from abroad, the exportation of horses, and the administration of the Orders made to prevent suffering to animals during transit. The Division includes a large staff of Veterinary Inspectors stationed throughout the country, and associated with it is the Ministry's Veterinary Laboratory at Addlestone where research is carried out on the scheduled diseases of animals and on the diseases of poultry. This is the only Division of the Ministry whose work extends to Scotland as well as to England and Wales.

A statement is attached giving further information of the work of this Division and the operation of the Diseases of Animals Acts.

The Education and Research Division comprises three Branches. The Education Branch is responsible for the administration of the grants for agricultural education to the University Departments of Agriculture, the Agricultural Colleges and the County Councils, and for the scheme of scholarships for the sons and daughters of agricultural workers. It includes sections which deal with all matters relating to the special schemes for dairy and poultry education, including the organisation of clean milk competitions, co-operative cheese schools, egg laying trials and and the egg and chick distribution scheme. The Research Branch administers the grants to the Agricultural Research Institutes, and deals with the work of the advisory officers attached to the Agricultural Colleges and University Departments, and with the award of scholarships and fellowships to research

workers. The Horticulture Branch administers the Acts and Orders relating to plant diseases and pests, including the control of importation and the issue of health certificates for exports. It is also responsible for all schemes for the development of commercial horticulture, including bee-keeping. The technical advice required by the Branch in connection with plant diseases is supplied by the staff of the Ministry's Plant Pathological Laboratory at Harpenden.

The Division maintains a joint Inspectorate for the local work of all three Branches.

The Live Stock Division is responsible for the administration of the grants for premium sires and milk recording Societies, and deals with the licensing of stallions and the export of pedigree stock. It is also responsible for the National Stud in Ireland. The Division includes a staff of Live Stock Officers stationed throughout the country, who also carry out any local inquiries required by the Statistical Branch.

The Land Division administers the Small Holdings and Allotments Acts, the Ministry's Farm Settlements, and the Lands Improvement and Settled Land Acts. It has a staff of Commissioners and Assistant Commissioners who act as the local agents of the Division in relation to the provision of small holdings by the County Councils. The Division also includes a Branch dealing with a wide range of questions arising under the Glebe Lands Act, the Universities and College Estates Acts, the Commons Acts, the Agricultural Holdings Acts, the Law of Property Acts and the Rats and Mice (Destruction) Act, as well as with the constitution of the County Agricultural Committees.

The Commercial and Tithe Division includes four Branches. The Tithe and Survey Branch, which has the largest staff of any Branch of the Ministry, deals with the redemption, apportionment and merger of tithe rentcharge, and with the examination and preparation of maps for all purposes required by the Ministry. The Commercial and Seeds Branch is responsible for the administration of the Seeds Act, the Fertilisers and Feeding Stuffs Acts, and the Merchandise Marks Acts and the Sale of Food and Drugs Acts, so far as they affect agricultural produce. The Land Drainage Branch deals with all questions relating to arterial drainage, including the constitution of Drainage Boards and the administration of grants in aid of Drainage schemes. The Publications Branch undertakes the preparation and issue of the Ministry's Journal, leaflets and other publications, and is responsible for the care of the Ministry's Library and for the management of the Ministry's exhibit at agricultural shows. There is also a small Publicity section for the issue of information to the Press, which is also responsible for wireless bulletins and films. This Division also deals with all questions connected with the development of rural industries.

The Fisheries Division is responsible for all the fishery work of the Ministry, including the administration of the Sea Fisheries Acts and the Salmon and Freshwater Fisheries Act, the collection of fishery statistics, and scientific research into fishery problems, which is carried out at the Fisheries Laboratory at Lowestoft by a staff of research workers and a research vessel. The Division has an outdoor staff of Fishery Officers and of Collectors of Fishery Statistics, stationed at the principal ports round the coast.

In addition to these Divisions at headquarters the Ministry has a Welsh Office at Aberystwyth, under the charge of the Welsh Secretary of the Ministry, which carries on the work of agricultural education, live stock improvement and the provision of small holdings and allotments in Wales.

MEMORANDUM ON THE OPERATION OF THE DISEASES OF ANIMALS ACTS, 1894 TO 1925.

Authorities concerned.

1. Local Authorities for the purposes of the Diseases of Animals Acts are defined in Sections 3 and 60 of the Diseases of Animals Act, 1894. Local Authorities now functioning are as follows:—

(1) *In England and Wales.*	
(*a*) County Councils	63
(*b*) County Borough Councils	82
(*c*) Councils of other Boroughs	123
(2) *In Scotland.*	
(*a*) County Councils	33
(*b*) Councils of Burghs	31
Total	332

2. The duties and powers of a Local Authority in any Borough or Burgh, the Council of which is not a Local Authority for the purposes of the Diseases of Animals Acts, are required to be discharged and exercised by the County Council who are the constituted Local Authority for any such Borough or Burgh.

Committees.

3. Every Local Authority for the purposes of the Acts is required to appoint a Committee or Committees, one of which may be an Executive Committee, and may delegate to them all or any of the powers of a Local Authority under the Act (except the power to make a rate) unless otherwise provided by an Order of the Minister.

Under the Ministry of Agriculture and Fisheries Act, 1919, which extends to England and Wales only, every County Council, except the London County Council, is required by Section 7 to establish an Agricultural Committee, and the London County Council and any County Borough Council *may* establish such a Committee, which in its turn must, under Section 8 of the Act of 1919, appoint a Diseases of Animals Sub-Committee which is required to act as the Executive Committee appointed under and for the purposes of the Diseases of Animals Act, 1894.

Duties.

4. Every Local Authority for the purposes of the Act of 1894 is required to execute and enforce the Act and the Orders of the Ministry thereunder. They must, under Section 35 of the Act, appoint so many Inspectors and other officers as the Local Authority think necessary for this purpose, and they must appoint at least one Veterinary Inspector and as many others as may be necessary. The powers of the Local Authorities are laid down in the Diseases of Animals Act, 1894, and in various Orders of the Ministry made from time to time under that Act.

Scheduled Diseases.

5. There are at present twelve diseases scheduled for action under the Act of 1894, viz., cattle plague, pleuro pneumonia, foot-and-mouth disease, sheep pox, swine fever, rabies, anthrax, bovine tuberculosis (certain forms only), sheep scab, glanders or farcy in horses, epizootic lymphangitis and parasitic mange in horses.

The Ministry is responsible for the diagnosis in each of the first seven diseases and the Local Authority for the five remaining diseases. Slaughter, with payment of compensation, only arises in cattle plague, pleuro-pneumonia, foot-and-mouth disease, sheep pox, swine fever, bovine tuberculosis and glanders. Except in bovine tuberculosis and glanders the slaughter is

carried out usually by the Ministry, who pay the compensation for animals slaughtered by the Department. In sheep pox, bovine tuberculosis and glanders only are the Local Authorities required to slaughter, but in addition they may slaughter in foot-and-mouth disease if they think fit. For any animals slaughtered by the Local Authority compensation has to be paid by them and not by the Ministry, but under the Diseases of Animals Act, 1925, the Ministry is required to pay to Local Authorities quarterly out of the Ministry's Vote, three-fourths of the gross amount of the compensation paid by Local Authorities for animals slaughtered on account of tuberculosis.

Powers.

6. Section 22 (xxxiv) of the Act of 1894 provides that the Minister of Agriculture may by Order confer upon the Local Authorities powers to make regulations for all or any of the purposes of the Acts, subject to such conditions as the Minister, for the purpose of securing uniformity and the due execution of the provisions of the Act, thinks fit to prescribe. The most important of the powers so conferred are:—

(1) Those under the Foot-and-Mouth Disease Order of 1895 and its amending Order of 1925, to make Regulations as to the movement of animals into or within their districts and as to the exposure of animals for sale in their districts;

(2) Those under the Sheep Scab (Amendment) Order of 1923, to make Regulations for the compulsory dipping of sheep within, or moved into, their districts;

(3) In foot-and-mouth disease powers are conferred upon Local Authorities by the Ministry under the Foot-and-Mouth Disease Order of 1895 to slaughter affected animals which have been in contact with the disease or otherwise exposed to infection, and to pay compensation therefor out of the local rates.

Having regard to the fact that it is the Ministry's policy itself to carry out slaughter in this disease when necessary, the power of Local Authorities to slaughter is not exercised in practice.

The powers referred to in (1) and (2) are exercised freely by Local Authorities.

Local Authorities may have power to make Regulations for various purposes in respect of other diseases. An Inspector of the Local Authority may enter any premises where he has reasonable grounds for suspecting the existence of disease or that the Act or an Order of the Minister or Regulations of a Local Authority has not been complied with.

Miscellaneous duties.

7. The duties of Local Authorities under the Acts include not only those relating to the actual scheduled diseases but also the enforcement of the Orders of the Minister relating to the importation, exportation and transit of animals and poultry, and the cleansing and disinfection of markets, fair grounds and sale yards.

Sections 2, 3, 8, 31-42 and 44-49 of the Diseases of Animals Act, 1894, contain the specific powers and duties imposed upon a Local Authority by the Diseases of Animals Acts other than those specifically laid upon them by Orders of the Ministry made under those Acts.

Joint Action.

8. Provision is made for the transfer of powers from one Local Authority to another, or the formation of a district, in Section 39 of the Act of 1894.

Finance.

9. So far as the Diseases of Animals Acts are concerned, this matter is regulated by the Act of 1894, Sections 40, 41 and 42 relating to England and Wales, and Sections 60, 61 and 62 to Scotland. The provisions of Section 18 (2) of the Act of 1894 should also be noted.

Central Supervision.

10. The Inspectors of the Diseases of Animals Branch of the Ministry of Agriculture and Fisheries maintain a general supervision over the administration by the Local Authorities of the Diseases of Animals Acts and Orders thereunder.

In case of default on the part of a Local Authority, provision is made in Section 34 of the Act for the Ministry to undertake any necessary administration and recover the expenses of such action.

Oral Evidence.

52,147. *The Chairman*: Sir Francis Floud, you are Permanent Secretary to the Ministry of Agriculture and Fisheries?—Yes.

52,148. You have been good enough to provide us with a note of your evidence; would you like to add anything to that at this stage?—No, I think not.

52,149. Taking a few points in the order in which they appear in your note of evidence, I see that, as far as possible, the practice of personal consultation between principal members of the staff has taken the place of writing long minutes to one another?—Yes.

52,150. Are records made of these conversations?—It rather depends on what they are; of the ordinary consultations inside the office we do not keep records, and the monthly conference with the Minister is not reported.

52,151. The Statistical Branch, you say, maintains a large staff of part time crop reporters and market reporters all over the country. Do you have inspectors checking the accuracy of these reports?—We have not a special staff of inspectors who do nothing else but that, but the live stock officers do act as inspectors for that purpose.

52,152. What is the basis of the remuneration of these crop reporters?—It varies according to the amount of work they have, but on the average it is somewhere about £100 a year; they are part-time people; they are valuers and land agents in private practice.

52,153. They are on fixed pay?—Yes.

52,154. Then the market reporters attached to the Statistical Branch are concerned, I take it, with reporting the prices ruling in the markets?—That is so.

52,155. Whereas the market investigators employed under the Marketing Branch are concerned with the organisation and the administration of the markets; is that so?—They are concerned with the study of the marketing problem; they are turned on to one particular commodity, as a rule, and devote their attention to that.

52,156. And collect all the information?—Yes, and then work it up into a report. The sort of men we try to get for that work are men who have had some training in economics and, if possible, some knowledge of the agricultural industry.

52,157. That staff is altogether separate from the staff of market reporters?—Yes, the market investigators are a purely temporary staff which is engaged in producing these reports.

52,158. How does the Marketing Branch reach the farmer or the grower with its advice?—In the shape of the reports which are published; this economic series of yellow books has been published dealing with a considerable number of principal commodities, they are circulated fairly widely through the agricultural community, and they are gradually, I think, leading up to

a considerable amount of attention being paid by the farmers' organisations to the problems that are dealt with, and in certain directions there are signs of a real movement.

52,159. The other day we had the advantage of visiting, as a Commission, an agricultural show and seeing a display of marketing?—Yes. That, of course, is another means by which it is brought home to the farmer; there are these demonstrations.

52,160. Those displays are arranged by the Ministry?—Yes, with the help of the funds supplied by the Empire Marketing Board.

52,161. Do you employ any peripatetic instructors in marketing?—No, we do not; we have not got to that stage yet. What we have really been engaged in up to the present is a study of the problems and of the actual conditions under which marketing is carried on; we have not yet got to the stage when we feel we are justified in making definite recommendations. We put out suggestions for the consideration of the industry, and in time I hope we shall be in a position to make more definite recommendations; but it is no use trying to force on the industry proposals that they have not really had an opportunity of considering.

52,162. In telling us about the Diseases of Animals Division, you mention that it is the only division of the Ministry whose work extends to Scotland as well as to England and Wales. How do you account for that fact?—Because it was considered at the time the Scottish Board of Agriculture was set up that it was inadvisable to separate the administration of the diseases of animals between two separate departments; disease knows no frontiers and it was considered better to deal with it through one organisation. Of course, there is constant movement of animals between the two countries, and if you had separate Boards administering separate regulations, it would certainly be inconvenient to the stock-owners in the two countries, as compared with the system under which they have only to deal with one department.

52,163. Do the Scotch give you any trouble?—I do not think they do, no.

52,164. Then you pass on to the Education and Research Division, and you describe the manner in which this division administers certain grants. From what sources do those grants come?—So far as education is concerned, the money is on the vote of the Ministry; so far as research is concerned, the money comes from the Development Fund.

52,165. *Professor Gangulee*: No money comes for educational purposes from the Development Commissioners?—Not for education, no: only for research. In the first instance it did come from the Development Fund, but now that the system is more or less stabilised and normal, it has been transferred to the vote of the Ministry and taken off the Development Fund.

52,166. *The Chairman*: Is the Ministry held to be responsible for good administration in the institutions which are supported by these grants?—To a certain extent. Of course, the main responsibility rests on the local authorities and the governing authorities of the colleges and university departments. The general policy which the Ministry has adopted in all these matters is not to carry out this work itself directly through its own officer, but to work either through the local authorities or the educational institutions of the country, or, in the case of research, through special research institutions. Thereby the actual workers, both in education and research, have the advantage of not being civil servants or Government officials. We think, on the whole, that that is a better arrangement and is more likely to commend their work to the people with whom they deal.

52,167. What means has the Minister of satisfying himself that efficiency is being maintained?—He has, of course, the power of inspecting their work, and he has each year the opportunity, when an application for the funds

comes in, of making any criticism or suggestions that he thinks fit; it is the power of the purse really. In the case of the local authorities, we pay two-thirds of their expenditure on agricultural education, subject to the submission of an estimate which has to be approved. In the case of the colleges, the grants are assessed for periods of five years; and in the case of the research institutions, they submit their budget each year.

52,168. Do you inspect?—Yes.

52,169. Who are your inspectors?—The inspectorate attached to the Education and Research Division.

52,170. *Professor Gangulee*: You have no executive control over the administration of the internal organisation of such institutions?—Only that we get an opportunity when the estimate is sent in to us; a research institution sends up, each year, its proposals for expenditure and the amount of the grant they require, and we have the opportunity then, if we think fit, of making any observations or criticisms or suggestions. But it is fairly well standardised now; there is a regular service of research officers: a graded service with graded salaries on different scales, and the whole thing is more or less uniform; so that in theory, at any rate, it is possible to move people about from one part of the research service to another just as if they were ordinary Government officials, and they have their own superannuation schemes.

52,171. *The Chairman*: Have there been cases where grants have been discontinued?—Not actually discontinued, but there is continual discussion going on, both between the Ministry and the institutions and between the Development Commissioners and ourselves in regard to expenditure.

52,172. I mean, discontinued on the ground of the inefficiency of the institution concerned?—No, we have never had actually to discontinue a grant altogether.

52,173. *Dr Hyder*: How are the grants fixed?—They are fixed really on the basis of the needs of the institution for the work which we think they ought to do. They vary considerably in the case of the colleges, for instance. Some of the teaching institutions have got a certain amount of funds of their own, either from endowments or other sources; and then the fee income of the different colleges differs. In the main, what the Ministry does is to make up the difference between their income from other sources and the total amount which we consider necessary to do the work which we want them to do.

52,174. *Professor Gangulee*: Do you suggest research problems to the institutes?—Yes, that is done, certainly; and there is a Research Council consisting of the heads of the different research institutions and representatives of the Ministry and the Development Commission, which exercises a certain amount of general survey over the whole problem.

52,175. Does the initiative for undertaking certain research come from the Ministry?—It may either come from the Ministry or from the institution; I mean the institution itself may put up proposals and say: "Here is a particular piece of work which we think ought to be done"; they include it in their programme and then that is considered.

52,176. *The Chairman*: Have you had any grants from the Development Fund for research work carried out in the Ministry's laboratories?—No; the Ministry's own laboratory at Addlestone is confined to administrative problems in connection with diseases of animals, and that is financed from our own vote.

52,177. *Sir Thomas Middleton*: Poultry?—Yes, special funds have been set aside from the Development Fund to enquire into poultry diseases, part of which is carried on at the Ministry's own laboratory.

Sir Francis L. C. Floud.

52,178. *The Chairman*: Then, is it the practice in every case to submit to the Development Commissioners the exact scheme upon which it is proposed to spend funds from the Development Fund?—Yes; the particular budget and programme of the institute goes to the Development Commission after the Ministry has examined it.

52,179. I think you have had experience of the relations between the Development Commission and the Ministry since the Development Commission was initiated?—Yes.

52,180. Has it been a success?—I think it has.

52,181. Do you hold with the principle?—I think so. I mean, it may appear to be rather a cumbrous organisation, but it works satisfactorily. From the point of view of pure routine there might be advantages, of course, in having all the funds on the vote of the Ministry; it would cut out one step in the procedure; but in point of fact I think we have found that the Development Commission has been a very useful body from our point of view and we have no complaint to make against it.

52,182. In your experience, have the activities of the Commission resulted in the elimination of unnecessary duplication in research work and in greater economy?—I think they have, certainly. It has also assisted in the co-ordination of work between the English and the Scottish departments.

52,183. You say the Live Stock Division " includes a staff of Live Stock Officers stationed throughout the country, who also carry out any local inquiries required by the Statistical Branch." What other functions do those officers discharge?—Their main business is the administration of the Live Stock Improvement Scheme; they have at any rate to approve, and very often actually to select, the premium sires that are placed out throughout the country.

52,184. They are whole-time officers?—Yes, they are whole-time officers, and, of course, they have to inspect the working of the milk-recording scheme.

52,185. Do you find that they work well with the servants of the local authorities?—Yes; but this part of the work, the Live Stock Improvement Scheme, is done directly by the Ministry and the local authorities are not concerned with that.

52,186. But, inevitably, in their work from day to day they must come in contact with certain of the local authorities?—Yes, of course they come in contact with the Agricultural Organisers and people of that sort, and I think the arrangements are satisfactory; the Live Stock officers are always men who have practical knowledge of stock.

52,187. Taking the whole field of the Ministry's activities in the country, do you find that your officers get along well with the servants of the local authorities?—I think the relations are very good indeed now in all the divisions.

52,188. *Sir Henry Lawrence*: Was there friction at an earlier stage?—No, I do not know that there was friction; there were difficulties in one or two directions; for instance, when we started the small holdings movement there was a certain amount of difficulty in getting the counties to take the scheme up and work it, but that has all passed away now. Of course, there is variation between different counties in the extent to which they really throw themselves into the work. In regard to education, for instance, there are some counties which do very little indeed and hardly maintain any staff of their own. We have no power to force them to do so.

52,189. *The Chairman*: There are cases in which, if the local authority fails, the Ministry has power to act, are there not?—Yes, with regard to diseases of animals we have very complete powers: we can do anything we like really. But with regard to education we have really only the power

of persuasion and the inducement of making a grant. At one time we had default powers in regard to small holdings, but that has gone now and we can only use ordinary powers of persuasion.

52,190. But, broadly speaking, there is an absence of any serious friction?—Yes, certainly.

52,191. You say you have a staff of Commissioners and Assistant Commissioners who act as the local agents of the Division in relation to the provision of small holdings by the County Councils. Is that for the purpose of informing the Minister?—No, the purpose of that staff really is to act as our agents for the purpose of approving the schemes submitted by the County Councils; we share in the cost, and so we have to approve the schemes.

52,192. Turning to the publicity section, could you give us an indication of the subjects in connection with which publicity is arranged for?—We issue periodically to the Press a short news sheet with any particular items to which we want publicity given. Then the wireless bulletin once a fortnight contains any particular news that we want broadcast and also a short summary of the market prices; and, once a month, we try to get some well-known agricultural expert to speak on some subject that he is competent to deal with.

52,193. Are the wireless bulletins appreciated by the farming community?—As far as we can judge, they are; we get a good deal of correspondence arising out of them and I think they are appreciated.

52,194. *Dr. Hyder*: Are these articles on agricultural matters that appear daily in the "Times" done by your Department?—No, the "Times" has its own agricultural correspondent; most of the papers have; but a good many of them, of course, do make use of material that is sent out from the Ministry; but each newspaper is responsible for the actual opinions, and so on, that are expressed in the paper.

52,195. *The Chairman*: You mention that the section issues films. How are those films prepared?—They are usually done by the British Instructional Films; we arrange with them.

52,196. A commercial concern?—Yes.

52,197. Have the films been a success?—I think they have. We have had some films quite lately in connection with the cultivation of sugar beet which have been shown in different parts of the country; I think they are of very considerable value in bringing to the attention of the farmers things that they might not otherwise know.

52,198. Do you show them in halls or buildings taken specially for the purpose, or do you show them through the cinema trade?—Both; we get them shown in the ordinary cinema houses, and also, if there is a particular gathering of agricultural people we very often arrange for a special show.

52,199. *Professor Gangulee*: Are any of the officers of the Ministry present at these shows to explain things?—Sometimes.

52,200. Or do you depend upon the County Council men?—It may be either; we are quite prepared to lend these films to the County Council officer and he can be responsible for making all the arrangements and being present, or in some cases the Ministry's own people may be there.

52,201. *The Chairman*: What is the extent of the Ministry's work in connection with fresh water fisheries?—It administers a rather formidable looking Act dealing with salmon and fresh water fisheries, sets up Fishery Boards and has duties with regard to the construction of fish passes and things of that kind.

52,202. On page 5 of your note, under the heading "Joint Action," you say: "Provision is made for the transfer of powers from one Local Authority to another." What does that mean?—That only means that you can have a joint district comprising the area of more than one local authority; for instance, in one case two County Councils join together to set up a joint committee to administer the Act in their area, by one body instead of having two separate ones.

52,203. With regard to the International Institute at Rome, is it your view that the taxpayer in this country is getting his money's worth?—I think he is; the statistical work of the Institute is certainly well worth the contribution that the British Government makes; it is not a very large amount, and I think everybody agrees that the statistical work of the Institute is valuable and is well done.

52,204. Is the absence of a resident representative a disadvantage to us?—No, I do not think it is; I do not think it is really necessary that we should have a resident man on the permanent committee.

52,205. Do you send a representative out from time to time?—Yes.

52,206. For how long does he remain there?—He is out there, as a rule, for about ten days at a time; he goes out perhaps three or four times a year. We have not definitely made up our minds that that will be the arrangement we shall always have, but we thought for the time being, at any rate, it was sufficient; and, of course, every two years there is a General Assembly to which we send representatives, when the whole work of the Institute and its expenditure is reviewed.

52,207. *Sir Henry Lawrence*: By what staff is the work carried on? Is it chiefly Italian staff?—Yes, that is one of the troubles really; the rate of pay is not sufficient, in general, to obtain the services of anybody but Italians. There are a few English people on the staff, but not very many.

52,208. *The Chairman*: Have you any views as to the services that the Institute might render to India?—I imagine that the statistical service would be of value to India. So far as the technical part of the work is concerned, I believe the general view is that it is not of very much use to us, but that it might be of considerable use in tropical agriculture. The Economic Bureau again is one in regard to which there is room for improvement. They have just appointed a new man as head of the Bureau; he is an Englishman, a youngish man, and I hope we may see some development there.

52,209. Have you any views as to the advisability of India appointing a permanent resident representative?—It is rather difficult for me to judge of that.

52,210. *Sir Thomas Middleton*: Reference was made to the fact that the Development Fund does not as a rule support educational activities; I am not sure whether it was made clear in your answer to Professor Gangulee that the Fund is available during the experimental period of any educational activity?—Yes.

52,211. And, as you said, when the experimental period is over, the necessary sum is transferred to the Ministry's vote?—Yes.

52,212. That is the position?—Yes.

52,213. That process is continually going on; I think the last transference was in the case of the scholarships of the Ministry for the children of agricultural workers?—Yes.

52,214. That was a definite educational experiment which was carried on for five years with grants from the Development Fund, and at the end of the five years period, as the experiment had proved successful, the Ministry took it over?—Yes, that is so.

52,215. The transference was made I think at the beginning of this year?—Yes; and, of course, the same thing has happened with regard to the Live Stock Scheme.

52,216. And in connection with the Local Education Authority's farm institute?—Yes.

52,217. So that the same position might arise at any time in the future; if there is a new educational activity it might in the first instance be a Development Fund charge and later on be transferred to the Ministry?—Yes.

52,218. Some reference was made to the Live Stock Scheme; that was a scheme which, in the initial stages, you had some difficulties in getting adopted by the local authorities, I think?—In the first instance, the Live Stock Officers were attached to the colleges and were not officers of the Ministry; but that was found not altogether satisfactory: after all, they are not members of the teaching staff, they have got to get about in the districts and get in personal touch with the farmers. Eventually it was decided that it would be better for the whole scheme to be taken over by the Ministry, and the Live Stock Officers were taken on to the Ministry's own staff.

52,219. Would you agree that this Stock improvement scheme has proved to be one of your most successful schemes so far as the wishes of farmers are concerned?—I think there is no doubt it has been one of the most fruitful schemes that has ever been adopted.

52,220. *Dr. Hyder*: What is this scheme?—This is a scheme for placing out high class sires for the use of the farmers, particularly the smaller farmers.

52,221. How many have you out in England?—We have about 1,400 bulls out and I think about 900 boars, a smaller number of heavy horses, and a few rams.

52,222. That is now?—That is now, yes. That certainly has been of enormous value; its influence has been considerably wider than with regard to the actual people who use the premium sires; I mean it has raised the general standard; if you place a premium sire in a county, the usual result is that the general standard of sires used by the other farmers goes up.

52,223. Do you charge a fee for the service?—Yes, a small fee is charged, and we give a grant towards the purchase or hire of the animal.

52,224. *Sir Thomas Middleton*: We have had a permanent representative at the Institute at Rome for quite a number of years I think?—We did, until Sir Thomas Elliott died.

52,225. And before Sir Thomas Elliott's time we had Sir James Wilson?—Yes, Sir James Wilson was there for some time.

52,226. I take it from your answer that the present arrangement is an experimental arrangement?—Yes, that is so.

52,227. Do the National Farmers' Union give any instruction in marketing in connection with their co-operative work?—No, I do not think I could say they give any instruction. They are beginning to give more attention to the economic problems of marketing, and they are taking part in some of the committees which are at present dealing with things like the standardisation of packages, the grading of eggs and that kind of thing.

52,228. Have any of the Local Educational Authorities taken up the subject of marketing? Have any of their officers specialised in the subject so far?—I do not think they have specialised very much. Some of the advisory economists have been paying a good deal of attention to it.

52,229. *Doctor Hyder*: You say, on page 3 of your note, that the development of rural industries is under the Commercial and Tithe Division. What industries are being developed?—One of the principal things we have done in that regard is to try and strengthen the position of the village blacksmith and the wheelwright, who were rather tending to disappear; we have tried to help them by getting them to equip themselves with more up-to-date plant: oxyacetylene welding and things of that kind. We have sent a demonstration van round to see what can be done in the way of better work of that kind, so as to make it possible for the village blacksmith still to continue to make a living in the village and to prevent his disappearance. He is a very valuable person from the point of view of the farmer and there was some danger that he was rather tending to disappear. In certain other directions the Rural Industries Intelligence Bureau has developed activities like village industries: glove making, basket making and things of that kind.

52,230. Taking the case of glove-making, I suppose you are thinking of the manufacture of these gloves in cottages?—Yes.

52,231. How does this manufacture fare in competition with manufacture in factories?—At the moment it is not doing at all badly, I think partly helped by a duty which has been placed on foreign gloves under the Safeguarding of Industries Act. In some parts of the West of England the glove-making industry is doing rather well at the moment.

52,232. You have been Permanent Secretary of this Department for a number of years; is not that so?—Seven years, yes.

52,233. Can you say anything about Ireland?—No, I am afraid I cannot; we have never had anything to do with Ireland; they have always had their separate department.

52,234. I was wondering whether the products of the cottage industry could stand the competition of the machine?—Of course, that is always a problem; there is bound to be rather a limited market I think, but the idea is that if you can maintain and revive to a certain extent the skill of the old village craftsman, there always will be a limited market for his work, not so much on the ground of price, but because it is of a rather different character from the machine-made article, and there are a number of people who are prepared to pay for it.

52,235. *Sir Henry Lawrence*: Has there been any success in this attempt to teach the blacksmith?—I think that has been quite successful; a number of the counties are quite keen; we have now two of these vans touring round, and a good deal of interest has been shown in it.

52,236. Do the counties have their own vans?—No.

52,237. *Doctor Hyder*: You say that the statistical work of the International Institute of Agriculture has been of use to you?—Yes.

52,238. I suppose you are referring to the statistics of other countries?—Yes.

52,239. Do not you think it is much better to pay twenty shillings and buy the volume rather than pay a thousand pounds to maintain a man in Rome?—We do not, as a matter of fact, maintain a man in Rome permanently. There may be advantages in having a man actually on the spot in Rome, because if he is there the whole time he can exercise more influence on the organisation of the Institute than if he only goes out for short periods. At the moment we are trying the other system, partly because they happen to have a very active and vigorous President of the Institute who is really taking the organisation of the Institute into his own hands for the time being. The Permanent Committee does not count for so much as it used to.

52,240. *Mr. Noyce*: Your educational branch has no educational institution directly under it?—Not actually belonging to the Ministry. The agricultural colleges, for instance, are independent bodies, merely receiving grants from the Ministry, and the other part of the educational work is done through the County Councils who have their own staff, towards which we contribute a considerable proportion: we pay four-fifths of the salary of the Agricultural Organiser and two-thirds of all the other expenditure.

52,241. There is no institution directly under the Ministry, as we have in India?—No.

52,242. On page 4, in regard to scheduled diseases, you say: "The Ministry is responsible for the diagnosis in each of the first seven diseases and the Local Authority for the five remaining diseases." That means, I take it, that both the Ministry and the local authorities have their own staff?—Yes; every local authority has a certain number of Veterinary Inspectors of their own; they are responsible in the main for dealing with certain diseases and the Ministry for dealing with certain others. The principal diseases for which the Ministry is responsible are foot-and-mouth disease and swine fever.

52,243. Does not that involve a certain amount of duplication?—No, I do not think it does; the local authorities would in any case have to have their own Inspectors, because they have to carry out and see that the orders of the Ministry are carried out; they do the local enforcement practically.

52,244. Are the local Inspectors under the Ministry in any way?—No, they are under the County Council, the local authority's Inspectors.

52,245. Then has the Ministry anything to do with the diseases that they diagnose?—We have an over-riding power, and we can make and we do make general orders governing the whole country; but the local regulation and the enforcement of the Ministry's general orders are in the hands of the local authorities.

52,246. *Sir Henry Laurence*: Are any veterinary dispensaries maintained by County Councils?—No. You mean for the provision of advice to the farmer by veterinary surgeons?

52,247. Yes, and for the reception and treatment of sick animals?—No.

52,248. None such are maintained, either by you or by local authorities?—No.

52,249. *Professor Gangulee*: The farmers depend chiefly on the private practitioners for the treatment of the diseases of their cattle?—Yes.

52,250. *Sir James Mackenna*: Do you know how Indian interests are being attended to at Rome now? Is Mr. Thompson attending to them?—Yes, he is for the time being representing India as well.

52,251. Am I correct in assuming that we have a Ministry of Agriculture for England, a Board of Agriculture for Scotland, a Board of Agriculture for North Ireland?—That is so.

52,252. And for Wales?—No, Wales is under the Ministry of Agriculture and Fisheries; we have a Welsh Office at Aberystwyth, but it is part of our machinery.

52,253. Each working independently, except in regard to cattle diseases?—Yes; there is a certain contact between them, of course, but they are independent bodies.

52,254. Can you conceive any super-Ministry dictating to or directing the whole three of them?—No, I cannot imagine that it would be accepted very readily either by Northern Ireland or by Scotland; the establishment of the Scotch Board of Agriculture, I think, was an assertion of the Scottish national spirit.

52,255. So that the position is very much the same as in India where, instead of three Ministries, we have got eight?—Yes.

52,256. Does the Development Commission come in as guide, philosopher and friend to the three of you?—Yes.

52,257. And brings gifts?—I am not quite sure; Sir Thomas Middleton would know whether they actually deal with Northern Ireland or not.

Sir Thomas Middleton: Not now, not since the Act; we deal now only with Great Britain.

52,258. *Professor Gangulee*: You have two divisions, one chiefly concerned with live stock and another with the diseases of animals?—Yes.

52,259. Do you think it is advantageous to have these two aspects of animal husbandry treated separately?—I think it is really necessary because you have to deal with entirely different kinds of staff; animal diseases must be dealt with by veterinary surgeons, whereas the improvement of live stock scheme must be dealt with by men who have practical knowledge of the breeding of animals.

52,260. With regard to these grants which you give to the research institutions, you have already given us the extent of the grants and the conditions of grant: but the task of co-ordinating experiments and research is undertaken by a particular branch, the branch of education and research?—Yes.

52,261. What is the exact machinery you have for that purpose? How do you bring the results together?—It follows on partly from the way in which the whole system has been built up; the general principle which has been adopted in dealing with agricultural research has been to set up research institutions and to give each institution one particular problem or set of problems; that is to say, to divide up the field between a number of institutions: Rothamsted of course dealing with the problems of the soils, Cambridge dealing with animal husbandry and animal pathology, East Malling, Long Ashton and Cheshunt dealing with horticultural problems, and so on. We think we have got the whole field fairly well covered, and each institution, in consultation with the Ministry is responsible for seeing that any new problems within their particular sphere are taken up and dealt with when opportunity arises. The Ministry, the Development Commission and the heads of the different institutions together act as the co-ordinating authority to see that there is no overlapping between two different institutions and also that the whole field is, as far as possible, covered. There are proposals at the present moment for an Agricultural Research Council to be set up to act as a further co-ordinating body, but no definite decision has yet been come to on that.

52,262. Who appoints the committees such as the committee for electro-culture and the committee for basic slag?—They are appointed by the Ministry.

52,263. These committees are directly under the Ministry?—Yes.

52,264. For instance, will the Basic Slag Committee be under the research station where the work is being done?—No, it is actually appointed by the Ministry; of course Rothamsted is represented on it.

52,265. What is the utility of these committees when you have allotted to certain institutions the work for which such committees are apportioned. Take the case of basic slag?—I think the ideal was to bring into the consideration of the problem certain interests which were not particularly represented at the research institution: for instance, the steel manufacturers.

52,266. These committees are supposed to send in, to the Ministry, reports of their activities?—Yes.

52,267. That is compulsory, is it?—The Ministry pays two-thirds of the cost, and so we have a right to see how they propose to spend their money.

52,268. You have a Council of Agriculture, have you not?—We have a Council of Agriculture, yes.

52,269. Will you describe its composition?—It is composed partly of representatives of the County Agricultural Committees: each county has an Agricultural Committee and each Agricultural Committee sends two representatives to the Council of Agriculture. In addition to that, there are certain representatives appointed by the Minister representing certain interests such as landlords, tenants and labour. This body as a whole is the Council of Agriculture which meets two or three times a year. It is a body independent of the Ministry; they can discuss anything they like, and the Minister, if he is present, is there only as a visitor.

52,270. The Ministry is not represented on the Council of Agriculture?—No, not as members.

52,271. *Mr. Noyce*: Who presides over it?—They elect their own Chairman.

52,272. *Professor Gangulee*: What is the total membership?—It is somewhere about 150 I think.

52,273. You have Boards of Conservators for fresh water fisheries?—Yes.

52,274. What is the composition of these Boards?—I am afraid I am not very well informed on that but my impression is that in some cases certain members, at any rate, are appointed or elected by the people who take out licenses for fishing.

52,275. Is the Ministry represented on these Boards?—No, I think not, but I should rather like to look that up and I can send you a note of the position.

52,276. *Mr. Calvert*: On this sheet,* showing the organisation of your department, there is a long list of various divisions and sections. Are those all under the control of members of the permanent Home Civil Service?—Yes.

52,277. Then, where does the technical expert come in?—They also, of course, are members of the Civil Service; I mean in certain cases, for instance, the Diseases of Animals Division, the responsible officer in charge of that division is the Chief Veterinary Officer, who is, of course, a technical civil servant.

52,278. Where does the expert come in in regard to live stock?—He comes in there as a Commissioner, if you take the Live Stock Division; the Live Stock Commissioner is the head of the staff of technical officers, the Live Stock Officers, in the country, and he is actually in control of all the application of the scheme in the country.

52,279. Do these technical heads of sections have direct access to the Minister?—If necessary, yes; I mean there is no objection to it at all; the Minister does, in fact, see them constantly.

52,280. In the normal course of procedure?—Yes.

52,281. Do these technical experts also have direct access to you?—Yes, certainly; we do not stand on any ceremony about that kind of thing; there is nothing to prevent anybody seeing either the Minister or anybody else if he wants to.

52,282. Then, where you say you are trying to reduce work by having more verbal consultation, does that also apply to the technical expert?—Yes, certainly.

52,283. Is no record made of his technical opinion when offered?—Not necessarily. If the Minister wants to see the Live Stock Commissioner, for

* Not printed.

instance, he sees him, and in the ordinary course no record would be kept of what they say to one another.

52,284. *Sir Thomas Middleton*: Minutes are not abolished?—No, they are not abolished, but they have been very much reduced. At one time it was not at all uncommon for people to exchange long minutes from one room to the next room.

52,285. *Mr. Calvert*: Sometimes it may happen that when the technical opinion of your expert is not accepted, he may wish to see that that opinion should be on record?—He can do that, of course.

52,286. Is there any complaint from the technical heads that their views are not brought before the Minister?—No, I do not think so. I do not think that, at present, there is any complaint of that kind.

52,287. The technical head who wanted to bring a particular point to the attention of the Minister would always be able to do so?—Yes, certainly.

52,288. With regard to the issue of these pamphlets on economic questions, could you give us a rough idea of the percentage of farmers who are influenced by them?—It is very difficult to judge of that; of course, the sales are comparatively small. If we sell 6,000 copies of one report, it is considered pretty good. But you cannot judge the extent of its influence merely by that, because, as a matter of fact, the agricultural correspondents of all the papers refer to them, and put in extracts from them. Every provincial paper pays a great deal of attention to agricultural questions and usually has an agricultural column or more once a week, in which further reference is made to them.

52,289. Would it be correct to assume from your answer that really the Press is a more powerful publicity agent than your pamphlets?—I think so; I think that is bound to be so. The actual circulation of official literature is always less in bulk than the extent to which it is broadcast by the Press and also to a considerable extent by the local staff of the County Councils. The Agricultural Organiser, for instance, is continually meeting and addressing farmers, and he makes use of the kind of information which is contained in the Ministry's reports.

52,290. In this country would you find no difficulty in getting the Press to publish any particular piece of information or warning that you wanted published?—I will not say there is no difficulty. It depends how it is presented; if it is presented in an interesting and palatable form there is no difficulty. But it is an important problem to get the matter right down to the farmer down the green lane.

52,291. To what extent has this organisation been created as the result of a demand from the actual farmers?—I think it would be only right to say that, in the main, it has been created from above.

52,292. Is the main function of this organisation to stimulate agriculture or to protect agriculture from certain specific dangers?—It is both. In regard to disease it is the latter, obviously; that is one of the primary duties of any Agricultural Department, and it can only be done by State action. But with regard to education and research, the object is to improve the technique of agriculture by making wider knowledge available for the benefit of the actual working farmer.

52,293. It is practically an example of a benevolent Government trying to help the farmer?—Yes.

52,294. Rather than the farmer demanding assistance from Government?—Yes; though it is equally true to say there has been a very great change in the general attitude of farmers, and the farmers' own organisation now is one of the strongest forces pressing for the extension of agricultural research.

52,295. Are the County Councils, as such, charged with responsibility in agricultural matters?—Yes, they have the general responsibility of organising technical instruction in agriculture, and some of them do a very great deal in that direction; others do less.

52,296. In your attempts to bring better methods to the notice of farmers, have you any local organisation through which you can work, or must you rely upon shows or pamphlets?—The local organisation is the County Council organisation; most County Councils now have an Agricultural Organiser who is their chief agricultural officer and he has under him a certain number of agricultural instructors: poultry instructors, horticultural instructors, dairy instrunctors, and so on.

52,297. But you do not have local organisations of practical farmers?—No, but they are all organised themselves in the Farmers' Union and they are constantly meeting; there is a good deal of contact between the educational officers of the County Council and of the Ministry, and the local branches of the Farmers' Union.

52,298. There is, in this country, practically no co-operative network of organisations to which you could appeal?—Not co-operative, no.

52,299. As an ordinary matter of procedure, do you have committees of technical experts on particular questions?—Yes.

52,300. Who meet as experts without the intervention of the administrative secretaries?—Yes.

52,301. Is there, in this Ministry, any systematic study of legislation in other countries designed to improve or protect agriculture?—Yes; and of course, we get a certain amount of help in that direction from the Institute at Rome which rather specialises in that. We have got a pretty good library which is regularly kept up to date, and information is collected about developments abroad.

52,302. Do you find that study of legislation with regard to agriculture in other countries profitable?—No, not as a general rule; in fact, one of the surest ways of enraging the British farmer is to talk to him about what is done in other countries.

52,303. How do these various orders issued by this department originate? What exactly begins an order, say, about noxious weeds or double dipping of sheep?—It originates as a rule on the advice of a technical officer in the Ministry; in the case of disease, for instance, if there is an outbreak of a new disease, the Chief Veterinary Officer and his staff would put up proposals for dealing with it.

52,304. That is to say, this Ministry really is the *fons et origo* of the whole activity?—Certainly, with regard to disease, yes.

52,305. *Sir Henry Lawrence*: I see that the estimates of your Ministry for this last year are £2,100,000?—Yes.

52,306. Can you give us any idea of how this is divided up under the several heads? What do you spend on your headquarters staff, for instance? —The cost of the staff, including fisheries, amounts to just under half a million pounds; that is the whole of the staff of the Ministry.

52,307. All over the country?—All over the country.

52,308. Not merely at headquarters in London?—No.

52,309. What would you call the secretariat? What would that represent out of the total? Would it be £20,000, or what, out of that £500,000?—More than that, if you include not only what you would call the secretariat, but all the administrative officers in the various divisions of the Ministry.

52,310. It is concentrated in London?—Yes.

Sir Francis L. C. Floud.

52,311. And that would represent 100 to 150 men?—More than that; the staff of the Ministry is about 1,400 altogether.

52,312. The staff of the Ministry at headquarters in London?—No, that is the whole staff of the Ministry. Out of that the number of travelling officers stationed out in the country is about 400.

52,313. Have you any knowledge at all of the personnel of the agricultural departments in India?—No, I am afraid I have not.

52,314. Have you formed any opinion as to whether they are adequate or inadequate?—I am afraid I have not any knowledge of that.

52,315. Do you recruit from the Universities, or how?—Yes, the ordinary staff of the Ministry, the administrative and clerical staff, is of course recruited in the same way as the whole of the rest of the Civil Service: from the Ordinary Civil Service examinations. The inspectorial and technical staff, of course, has to be separately recruited; the ordinary practice there is to try and get young science graduates from the University at the age of about 28, who have taken a science degree with Honours and then have had some practical experience of the particular class of work we want them for. In the same way, for the veterinary staff we recruit men who have got their veterinary qualification and have some experience of actual practice.

52,316. You take them on at about the age of 28?—That is about the age at which we take them on.

52,317. You do not train your young men yourselves at all?—They have to be trained after they come on at that age, but they do come on at that age having had some actual experience.

52,318. In private employment?—Yes. We have very varied work: we have disease work, we have land agents for small holdings and allotment work who preferably have had training as valuers and surveyors and have taken the examination of the Surveyors' Association; then we have the scientific people in various branches of science who have taken a degree with Honours at a University.

52,319. They actually become valuable to you from the age of 32 onwards?—Yes. I do not say they do not become valuable even earlier than that, because in the first instance they are turned on to less important work. We have a good deal of work of a police character to do: work in connection with plant diseases, such as the wart disease of potatoes, and that sort of thing.

52,320. Do you take graduates from the agricultural institutions of Oxford and Cambridge?—Yes.

52,321. For the ministerial and technical work?—For the technical work; they may also come in in the ministerial work; if so, they come in the ordinary staff recruited for the Civil Service as a whole. If a man goes in for the Civil Service, it is more or less a matter of chance, if he is successful, whether he goes to the Ministry of Agriculture, the Post Office or the Treasury.

52,322. But do you not select men from the agricultural courses of Oxford and Cambridge, or any other institutions and appoint them by selection?—Not for administrative work.

52,323. By competition?—Yes; there is very great objection, of course, nowadays to anything in the nature of patronage appointments, however carefully they are made; and, even in the case of our technical staff, the whole thing is removed from the region of personal patronage by selection being made by a Selection Committee consisting of the principal technical officers of the Ministry and a representative of the Civil Service Commission.

52,324. How is the balance of your estimates utilized?—It mainly goes in grants; agricultural research accounts for about £300,000 a year and

agricultural education for a little more. The Live Stock Improvement Scheme costs about £50,000 a year. Diseases of Animals is a variable quantity depending on the amount of disease; in some years it may be very high while in others it is comparatively low.

52,325. Does that include compensation for live stock destroyed?—Yes.

52,326. That is sometimes very heavy?—Yes; a few years ago it cost something like £4,000,000.

52,327. *Sir Thomas Middleton*: How many veterinary officers do you employ in the Ministry at present?—I think it is just over 100.

52,328. About how many are employed by the local authorities?—Each local authority has one Veterinary Inspector. There are 330 local authorities under the Diseases of Animals Act, but their Inspectors are not all whole time.

52,329. So that there is a very large staff engaged in controlling disease?—Yes, there is, and of course the services of the Police are used to a very large extent; they are really responsible for the actual enforcement of the regulations.

52,330. Your system of notification is very perfect; you get notification almost immediately?—Yes, I think the reports are made very well now and we do get early notification in the great majority of cases.

52,331. It is very rarely that there is delay, and when there is delay, one hears about it everywhere?—Yes, and of course, if necessary, proceedings are taken for failure to report.

52,332. Would you agree that without a strong staff such as you have, and without immediate notification, it would be quite impossible, even in a country like this, to control disease?—I agree; I think early notification is essential in order that effective measures may be taken.

52,333. *Professor Gangulee*: Could you give us an idea of the training of the County Council Organisers?—The Agricultural Organisers, as a rule, are men who have had training in an agricultural college or a university department, and have, either then or before, had some practical work on a farm.

52,334. What salary do they get when they first enter the Service?—It varies in the different County Councils, but I suppose, on the average, most of them get between £600 and £800 a year. They are a very good lot of men.

52,335. I have come in contact with some of them; they are an excellent set of men?—Yes.

(The witness withdrew.)

Mr. T. JONES, Committee of Civil Research, London.

The Royal Commission has asked for a note of the evidence which I might wish to give. Perhaps the best plan will be to give you a copy of the Treasury Minute setting up the Committee of Civil Research (Cmd. 2440, 1925).

TREASURY MINUTE DATED 13TH JUNE, 1925.

The First Lord calls the attention of the Board to the decision of His Majesty's Government on 28th May, 1925, to establish a Committee of Civil Research. This will be a Standing Committee reporting to the Cabinet, analogous in principle to the Committee of Imperial Defence.

The President of the Committee will be the Prime Minister and the regular Chairman, in the absence of the Prime Minister, will be a Minister

nominated by him for the purpose: the membership of the Committee will, as in the case of the Committee of Imperial Defence, consist of such persons as are summoned by the Prime Minister, or the Chairman on his behalf.

The Committee will, like the Committee of Imperial Defence, be an advisory body and will have no administrative or executive functions.

The Secretary of the Cabinet and the Committee of Imperial Defence will be responsible for the Committee's secretarial arrangements which will be under the immediate supervision of Mr. T. Jones.

The Committee will be charged with the duty of giving connected forethought from a central standpoint to the development of economic, scientific and statistical research in relation to civil policy and administration, and it will define new areas in which enquiry would be valuable Within these limits the Committee may consider such questions as are referred to it by the Cabinet, the President, the Chairman, and Government Departments.

The President (or Chairman) may also summon for consideration of particular business such outside economic, scientific and statistical experts as he may think fit.

The Committee will—on the analogy of the Committee of Imperial Defence —as a normal part of its working approve the reference of particular enquiries to special sub-committees, which may include outside specialists as well as expert officers of the Department or Departments mainly concerned. Provision will also be made for using the services of suitable Departmental Officers in the capacity of Secretary to such sub-committees as occasion requires.

MY LORDS APPROVE.

Oral Evidence.

52,336. *The Chairman*: Mr. Jones, you are Secretary of the Committee of Civil Research, London?—Yes.

52,337. We have had your note of evidence; is there anything you wish to add at this stage?—I think the Treasury Minute sets out, in a concise form, the character of the Committee of Civil Research; it refers to the parallel of the Committee of Imperial Defence. There is a fuller description which it might be interesting to the Commission to have on the minutes: there was a debate in the House of Lords on Tuesday, the 30th June, 1925, when Lord Balfour described at some length the object of the new Committee; and there was a recent debate on the 12th May, 1927, in which Lord Balfour gave some account of the work which the Committee had in the interval carried out.

52,338. Thank you for those references. What is the composition and size of the main Committee?—It consists of the Prime Minister as President, and a Chairman nominated by him, who in this Government, has been Lord Balfour. There is nobody else. Then, when any special inquiry is undertaken, we add members suitable for the purposes of the inquiry. The constitution is very elastic; we are not confined to members of the Government, nor to civil servants, but are free to go outside.

52,339. The terms are about as wide as they well could be?—Yes, that is so.

52,340. How often does the main Commttee meet?—It meets when undertaking inquiries when we have some reports from Sub-Committees to lay before it. I might perhaps give you a list which I have here of some of the enquiries we have conducted during the last couple of years.

52,341. Would that be equivalent to the number of Sub-Committees constituted?—It would contain the principal Committee; some of the enquiries

are conducted by the main Committee on which Cabinet Ministers sit and, with them, outsiders. Then, for less important enquiries we have Sub-Committees, of which perhaps neither Lord Balfour nor a member of the Cabinet will be Chairman; we may have, as we have at present, say a member of the Labour Party in the House of Commons, who may be Chairman of the Committee. Then that Sub-Committee will report to the main Committee. We have had inquiries into the future of the British Dye-Stuffs Corporation, Overseas Loans, Indian Railways, the Iron and Steel Industry, and Agricultural Training. We have at the present moment Sub-Committees dealing with the Severn Barrage Scheme, the Empire Supply of Quinine, the British Pharmacopœia, the Mineral Content of Natural Pastures.

52,342. That is Kenya?—Yes. Then we have a Sub-Committee on Native Welfare Research in Kenya, the Government's Research Organisation, the Tsetse Fly Inquiry, Geo-physical Surveying and Natural Dietetics. That will give you some idea of the range of the activities of the Committee of Civil Research.

52,343. Have you a large permanent secretariat?—Mr. Hemming and myself compose the secretariat. I need hardly say that our knowledge is somewhat superficial over this wide range of subjects.

52,344. Who act as secretaries of these Sub-Committees?—I do, or Mr. Hemming. When we have a Committee in which a department is specially interested, we co-opt a joint secretary from the department, who has a more special knowledge of the particular subject than we have.

52,345. In the case of most of the Sub-Committees appointed *ad hoc* for particular subjects, are members of departments appointed specially for the purpose?—In the case of membership partly, and partly experts from outside.

52,346. Experts from outside occasionally act as secretaries?—No, not as secretaries; as secretary we may co-opt somebody who specialised on the subject in the department concerned.

52,347. In practice, who, as a rule, suggests new areas of enquiry?—The subjects come up in all sorts of ways. In the case of the Kenya Research there was a despatch to the Secretary of State for the Colonies from Sir Edward Gregg, and in that case the Secretary of State moved the Lord President to appoint the Committee. Sometimes letters are sent to Lord Balfour, as it is known that he is interested, and he brings the matter up.

52,348. What is the geographical scope of the Committee's responsibilities: is it Empire-wide?—Yes.

52,349. It includes the Dominions?—Yes.

52,350. And India?—Yes.

52,351. With whom do you correspond in the Dominions?—We move the Secretary of State for Dominion Affairs, or the Secretary of State for India, as the case may be.

52,352. Does the Committee concern itself with the financing of its recommendations?—No, it has no executive functions; it has no money to spend, and it is very chary of referring to finance.

52,353. It does not suggest how other people should spend their money?—It sometimes suggests to the Empire Marketing Board, for example, a particular expenditure. I am quoting a particular case: we did that in connection with quinne.

52,354. Does the Committee suggest that particular pieces of research should be carried out in particular institutions?—Yes, we have done that, we have done that in the case of the tstetse fly.

52,355. Breaking up a large area of research into its component parts?—Yes, and suggesting experiments in particular areas, experiments which

while carried on in a particular Colony, may redound to the advantage of the Empire generally.

52,356. *Professor Gangulee*: Are your suggestions carried out?—Yes, I must say we have met with very active co-operation. We work through the Departments of course.

52,357. *The Chairman*: How do these Sub-Committees proceed? Do they hear evidence in any case?—Yes, they can call in outsiders or members of the departments.

52,358. Are the proceedings on those enquiries public or private?—Private.

52,359. In every case?—Private in every case. They are regarded as Committees of the Cabinet.

52,360. Does the Committee engage in any publicity at all?—No, none.

52,361. *Dr. Hyder*: Publications are issued, are they not?—We make no public report. The normal course would be that a report on a particular question is drawn up, submitted to the Cabinet, and referred to the appropriate department which deals with it. Then, there are certain subjects which are not of themselves confidential, and, in fact, as to which publication of the results would be advantageous. Any publicity of that kind is given effect to by the department, not by the Committee of Civil Research. The point you are on now has come up once or twice; this is the Minute on which we work: "That the Secretary of State for Dominion Affairs should be authorised to communicate Doctor Orr's report of his visit to Kenya and the summary of the replies to the questionnaire on mineral deficiencies to the Empire Marketing Board for such publicity by means of communiques as they may think proper; that as regards the future the principle to be adopted should be that the Committee of Civil Research papers should normally be regarded as confidential, but that where, in the opinion of a Sub-Committee, it was desirable for the advancement of scientific knowledge or otherwise that the contents of any particular paper should be made public, the question should be referred to the Committee of Civil Research, who should decide whether the paper should be published, and, if so, in what form." That is a particular case. We do not really publish ourselves, but we discuss the matter with the departments concerned.

52,362. *The Chairman*: Has the work of the Committee grown?—Yes; but we are moving modestly, because, being a new Committee, we wish to carry the departments with us, so that we rather wait to be stirred by them than take a very active part in initiating enquiries ourselves.

52,363. Do you think it likely that the Committee will grow into something in the nature of a simple advisory body in matters of research for the whole Empire?—The Dominions and the Crown Colonies are themselves much more alive, I think, to the importance of research than they used to be, and are themselves setting up organisations. We may be able to do something more in the nature of co-ordination.

52,364. *Professor Gangulee*: What success did you have with India?—We have had two or three enquiries which have some bearing on India; we have a Sub-Committee on the Empire supply of quinine, to which I referred, with Lord Balfour in the chair, Sir Louis Kershaw, a member and Colonel James, who is a Medical Officer of the Ministry of Health, who was formerly in India, Doctor Andrew Balfour, Sir David Prain and Colonel Gage. Those are members of this particular Sub-Committee. We had valuable reports from the Secretary of State for India circulated to this Sub-Committee, and their recommendations really amounted to this, that as a first step a grant at the rate of £2,000 a year for ten years should be made to the Amani Institute (in Tanganyika) to enable it to

restore and extend its previously existing cinchona plantations, with a view to extending Empire supplies and undertaking research. We regard this problem rather from the point of view of the Empire than of India; we understand that India could not do anything in the way of exporting quinine to the Empire; you have to meet your own needs. That is what we did and that is going on. In the case of the enquiry into the Indian State Railways, that was a Committee of the Cabinet, they just examined the policy of the Indian Government in regard to railways from the point of view of our iron and steel industry; that was the object of that Committee. Then I think the enquiries that are going on, into dietetics, in Kenya and into the mineral content of pastures may have a very important bearing on your life in India; but it is a bit soon to say anything about it.

52,365. That Committee is still sitting on the question of the native dietetics?—Yes, research is going on in Kenya; experimenters have been sent out who are under the control of Doctor Orr and the Lowett Research Institute at Aberdeen.

52,366. *Mr. Calvert*: I gather that this Committee is not so much one of research as one for the collection of information?—Its own staff does not conduct any research at all.

52,367. This enquiry into the Empire production of quinine was rather an attempt to collect the existing information than to discover knowledge not previously known?—It was to try to see if anything could be done to extend the supply. The upshot of the Committee has been that we are stimulating research in Tanganyika.

52,368. *The Chairman*: But you do suggest the manner in which particular lines of research could be carried on?—Yes, quite definitely, but we do not conduct research ourselves.

52,369. *Sir Thomas Middleton*: The characteristic of your organisation is its extreme flexibility?—That is so.

52,370. When the idea of the Committee was first discussed, was not the main thing which was considered essential in regard to the constitution of such a body that of flexibility?—Yes. We had the example of the Committee of Imperial Defence to go upon, which has the same constitution precisely as this body. It began over 20 years ago very quietly, and it has grown to be a very valuable Committee. It was, I think, the example of that Committee in dealing with war problems which suggested that something analogous might be set up to deal with some of the problems of peace, which are very much more difficult, I may suggest, because of the manner in which political parties approach some of the economic problems which might be looked at by a Committee of this kind.

52,371. Was it the case that, at the time this Committee was set up, the subject of the best form of organisation was carefully reviewed before the model of the Committee of Imperial Defence was adopted?—Yes, that is so. There are a number of memoranda which were circulated to the Government which I cannot very well quote here.

52,372. Do you find that your machinery for collecting information acts smoothly and that you are getting satisfactory replies to your questionnaires?—We have met with a most excellent response from all the departments and from the Governments of the Dominions and Colonies. The fact that the Prime Minister and Lord Balfour are at the head of the Committee gives it a certain prestige; so that when we send these questionnaires out, as we have done for example on natural pastures, we have found those enquiries taken seriously, and scientific men and officers of the various Governments have gone to great trouble to prepare valuable memoranda, some of which have brought to the notice of scientific men at home knowledge

of which they were previously ignorant. Similarly at home, we have never any difficulty in getting the leading scientific men of the country to accept the responsibility of coming on these Committees and giving considerable time to the work of the Committees. We have every reason to be not only satisfied but most grateful to scientific men who are co-operating with us.

52,373. *The Chairman*: Have you a library?—No.

52,374. But you are, I think, accumulating large masses of literature?—We are in touch with all the scientific libraries. We are accumulating a large mass of literature under those various subjects, which is available in the Cabinet Office for Government members and members of the Committee. Take the British Pharmacopœia. That is of interest to India. That is an example of the kind of enquiry which none of us would have expected would have come under this particular Committee, but it came from the Privy Council to us. We have sent out questions as to how they would like the next edition of this Pharmacopœia prepared: "In the case of India you have a number of indigenous drugs. Would you like them incorporated in the main body of the book, or would you like to have a special Indian appendix or addendum?" That is the sort of problem.

52,375. Do you receive the bulletins of research institutions?—We do not ourselves, but Mr. Hemming, my assistant, has very wide acquaintance with technical and scientific libraries in London, so that we are able to draw upon them.

52,376. *Professor Gangulee*: In drafting technical questions, do you get the assistance of experts?—Yes.

52,377. For instance, with regard to questions on tropical dietetics?—Yes. Those were drawn up by the experts.

52,378. The expenditure in connection with your staff comes from the Parliamentary grant?—In addition to being Secretary of this Committee I am Deputy-Secretary to the Cabinet. Mr. Hemming is seconded from the Treasury, and we share a typist.

52,379. Is there any particular budget allotted to this Committee?—No. We draw on the Cabinet Office pool.

(*The witness withdrew.*)

Sir JOHN MacFADYEAN, M.B., B.Sc., M.R.C.V.S., LL.D., Principal, Royal Veterinary College, London.

NOTE ON THE ORGANISATION OF THE VETERINARY TEACHING AND PRACTICE IN GREAT BRITAIN.

The history of veterinary science and practice in Great Britain begins with the foundation of the first of the Veterinary Colleges in this country, viz., the Royal Veterinary College, in the year 1791. The Edinburgh Veterinary College was the second to be founded, viz., in 1818. These two Colleges between them carried out the work of teaching students and granting them a diploma setting forth their ability to practise. It is important to note that the two Colleges not only taught the students, but also carried out examinations to determine the extent of their knowledge and their fitness for discharging the duties of a veterinary surgeon. As the veterinary surgeons who were thus qualified grew in numbers they naturally became dissatisfied owing to the fact that they had no voice in determining the subjects of the veterinary student's study or in carrying out the examinations, on the result of which a diploma was granted. In 1844 the then existing veterinary surgeons were incorporated by Royal

Charter as the Royal College of Veterinary Surgeons, and *inter alia* they were given power to regulate the nature and extent of the examinations, and to appoint persons to examine and determine upon the fitness and qualifications of students desirous of becoming members of the corporate body. The other Colleges now in existence in addition to those in London and Edinburgh are the Glasgow Veterinary College, founded in 1862, the Dublin Veterinary College, founded in 1900, and the Veterinary School of the University of Liverpool.

All the five Veterinary Colleges have equal rights with regard to training students for the veterinary profession, but it is the Council appointed by the Royal College of Veterinary Surgeons that is supreme in determining the nature and extent of the veterinary student's general and professional education. Students can only be made eligible for these examinations by undergoing the prescribed courses of study at one of the five Veterinary Colleges. The minimum period of study at present is four years, and the standard of the general knowledge examination which a student must pass before he begins his professional study at one of the Colleges is the same as that for admission to the medical profession.

Up to the year 1880, the Veterinary Colleges in co-operation with the Royal College of Veterinary Surgeons did excellent work in providing the country with trained veterinary surgeons, but these had been only partially effectual in getting rid of ignorant uneducated men who still gave themselves out to be veterinary surgeons and obtained a livelihood in that way.

In 1881, the Veterinary Surgeons Act was passed "to enable persons requiring the aid of a veterinary surgeon for the cure or prevention of disease in or injuries to horses and other animals to distinguish between qualified and unqualified practitioners." This Act followed on the lines of the previously passed Medical Act in that it protected the title of veterinary surgeon.

To sum up, the control of veterinary education up to the standard considered necessary for practice is in the hands of the corporate body which includes all the veterinary surgeons who have obtained the Diploma of the Royal College of Veterinary Surgeons. It is the Council of that body that (1) fixes the minimum standard of the intending student's general education; (2) prescribes the duration of study at one or other of the Veterinary Colleges; (3) determines the subjects to be studied during the four years; (4) appoints the examiners, and fixes the time and places of the examinations.

The examinations are conducted twice a year, viz., in December and July. The written examinations are held simultaneously in London, Edinburgh, Glasgow, Liverpool and Dublin, and the same board serves for Great Britain and Ireland. The number of living members of the Royal College of Veterinary Surgeons at the 31st December last was 3,496, and with the exception of about 400 who practise in parts of the British Empire beyond the seas or in foreign countries the whole of the members of the Royal College of Veterinary Surgeons are in practice (or have retired from practice) in Great Britain or Ireland. At the present time the number of those who are admitted to the profession annually is just about equal to the number that die off the register. The present number is barely sufficient to meet the needs of the country.

The immense majority of the veterinary surgeons in this country are engaged in private practice, carrying out duties in connection with animal diseases, similar to those discharged by general medical practitioners in connection with human disease.

Of the total number only about 400 are not in general practice, but are engaged in whole-time public services, such as the Army, the Ministry of Agriculture and Fisheries, the Municipal Corporations, etc. The Veterinary

Officers of the Ministry of Agriculture are concerned only with the work relating to the contagious diseases of animals. A small number of the profession in this country who are engaged in private practice are also employed by Local Authorities in connection with the contagious diseases, but the great majority have nothing to do with the contagious diseases, but earn their living by treating the ordinary ailments and accidents of the domesticated animals.

The qualifying diploma which is granted by the Royal College of Veterinary Surgeons represents the minimum standard of knowledge which anyone intending to commence practice as a veterinary surgeon ought to possess, but diplomas or degrees representing a higher standard of knowledge are obtainable. The Universities of London, Edinburgh and Liverpool grant higher degrees in Veterinary Science, but only to those who have already obtained the Diploma of the Royal College of Veterinary Surgeons. The additional training which is imposed on students who desire to take these extra qualifications is largely intended to provide recruits for the staffs of teaching and research institutes.

The Royal College of Veterinary Surgeons grants a second Diploma in addition to the qualifying Diploma which every veterinary surgeon must obtain. The second qualification is the Diploma in Veterinary State Medicine. It was instituted recently in order to provide veterinary surgeons with post graduate training to fit them for duties in connection with the work they might have to undertake in connection with the contagious diseases of animals under the Ministry of Agriculture or the Local Authorities throughout the country, or as Meat Inspectors.

The special course of instruction prescribed for those who intend to take this qualification can only be begun after the student has obtained the Diploma of the Royal College of Veterinary Surgeons. The prescribed instruction is in connection with Veterinary Bacteriology and Protozoology, Veterinary Hygiene and Toxicology, Meat Inspection, and Dairy and Milk Inspection.

Research.

There are now four institutes at which research regarding the diseases of animals is prosecuted, viz., the Laboratories of the Ministry of Agriculture, the Research Institute at the Royal Veterinary College, the Research Institute at Cambridge, and the Laboratory of the Animal Diseases Research Association in Edinburgh. A certain amount of research is also carried out at the Veterinary School in Liverpool.

The cost of the researches conducted at these institutions is mainly defrayed by grants which are allocated through the Ministry of Agriculture.

From what precedes it will be seen that the conditions with regard to veterinary practice are very different in India and the United Kingdom, because of the denser animal population, the greater individual value of the animals, and the different incidence of important diseases in the Home Country.

In Great Britain and other European countries the services rendered by veterinary surgeons are mainly in connection with what may be called the ordinary diseases of domesticated animals. Work of that kind is the main occupation of about 80 per cent. of all the veterinary surgeons in the country, and does not require any organisation by Government. In India on the other hand the main duty of veterinary surgeons is to prevent or control the contagious diseases, and the most important of these, viz., cattle plague, hæmorrhagic septicæmia and surra, are unknown in the Home Country. The veterinary profession in India is thus similar to the small section of the profession at home whose work is entirely or mainly in connection with the contagious diseases of animals, which work in the

course of years has been organised to a degree that is scarcely conceivable in India, where the notification of the suspected existence of contagious disease (which is the keystone of the Contagious Diseases of Animals Act) could hardly be enforced as it is in this country.

QUESTION 15.—(a) I do not think it advisable that the Civil Veterinary Department should be under the Director of Agriculture.

Oral Evidence.

52,380. *The Chairman*: Sir John MacFadyean, you are the Principal of the Royal Veterinary College, London?—Yes.

52,381. You have provided us with a note of the evidence which you wish to give. Do you desire to add to it at this stage by any oral statement?—No. I do not think there is anything I want to say beyond what is expressed in my note.

52,382. The Diseases of Animals Act is adminstered in the counties by Veterinary Officers, members of the profession, under the Ministry. Is that so?—That is so.

52,383. Has that brought about any friction at any time between those veterinary officers, members of the profession, and officers of the department?—I do not think so; nothing of any note. As I explain in my note here, there are veterinary surgeons whose whole time is employed in connection with the administration of contagious diseases under the Ministry, but there is also a considerable number of veterinary surgeons in private practice who also carry out these duties under the local authority.

52,384. You say at the top of this page that you do not think it advisable that the Civil Veterinary Department should be under the Director of Agriculture?—Yes.

52,385. Are circumstances in India in any way analogous to those existing in this country?—No; they are very different, of course. My reason for saying I do not think it would be advisable is that I doubt whether you will be able to get, in the same individual, the amount of knowledge regarding veterinary adminstration and research and education and a similar knowledge with regard to agriculture.

52,386. The fact that, in this country, the majority of the profession are engaged in private practice, whereas in India private veterinary practice is hardly known, makes the conditions in the two countries entirely different, does it not?—Yes, very different.

52,387. Are you familiar with conditions in India?—No, I cannot say I am familiar with them. I spent a few months in India about 1912-13, when I was sent to investigate foot-and-mouth disease. I know generally about the Veterinary Department in India and research there, but that is the only occasion on which I have been in India.

52,388. You know that veterinary matters are, in the main, the responsibility of the Provincial Governments under the existing constitutional position, do you not?—Yes, I know that.

52,389. Have you formed any view as to whether it would be practicable to deal with epidemic animal diseases in a country as large as India while it is divided up, for matters of veterinary administration, into separate Provinces?—I think there would always have to be central control at any rate.

52,390. So far as epidemic diseases are concerned?—Yes, I think so.

52,391. That was found necessary as between England and Scotland, was it not?—Yes, that is so.

52,392. Have you applied your mind to the problem of training veterinary officers in India?—Is that just passing them through the veterinary schools there?

52,393. Take that first?—No, I have not thought much about it. I am, of course, acquainted with the nature of the instruction that is given there.

52,394. Do you think it likely that the Royal College of Veterinary Surgeons would recognise a degree given in India?—They would have to satisfy themselves that the degree given in India was quite equivalent to the one given here as the result of the examination conducted by themselves. Besides that, they would have to be assured that the training was good, and the students would have to pass precisely the same examination in general knowledge.

52,395. Subject to those conditions, would you suggest that an Indian degree might qualify recipients to practise throughout the Empire?—Yes. I think the Royal College of Veterinary Surgeons would have difficulty in finding a reason for refusal.

52,396. Have you any personal experience of Indian students who come to this country for training?—Yes. The majority of Indian students who come here to qualify in veterinary science come to the Royal Veterinary College.

52,397. What do you say about the calibre and qualifications of those students?—I may say about them as about others, that they are very mixed. There are good, bad and indifferent. That is about all one can say.

52,398. Can you say whether there has been any improvement in their training of recent years, as shown by their qualifications when they come over?—We do not admit them until they have passed one of the examinations in general knowledge recognised by the Royal College of Veterinary Surgeons, and, of course, that ensures that very ignorant students are not sent over here.

52,399. What training have these men had in India before they come over?—None whatever, so far as we know. We have, occasionally, graduates who have obtained the diploma granted by one of the colleges in India who come here to take the diploma of the Royal College of Veterinary Surgeons afterwards. Very few of these would be able to pass the examination of the Royal College of Veterinary Surgeons without a great deal of study.

52,400. You mention in your note of evidence that, apart from the ordinary degree, the College gives a diploma in Veterinary State Medicine?—Yes.

52,401. Could you give the Commission an outline of the curriculum?—In the first place, with regard to the subjects in which students have to receive post-graduate training and examination, these include epizootiology, veterinary bacteriology and protozoology, and veterinary hygiene and toxicology. In addition they have to be examined on matters relating to meat and milk inspection.

52,402. Is there any special training in administrative affairs?—The regulations are that after attaining the Membership of the Royal College of Veterinary Surgeons, a candidate must have, during twenty weeks, received instruction in the subjects that I have just mentioned, and that during a period of ten weeks they have received a course of practical instruction in chemistry, and that during a period of fifteen weeks they have been diligently engaged in acquiring a knowledge of the duties of veterinary inspection in the administration of a State Department, County Council, Municipality or Urban Authority employing one or more whole-time Veterinary Surgeons.

52,403. *Sir Thomas Middleton*: Do these weeks run concurrently, twenty, ten and fifteen?—Yes, they can be concurrent. I believe students have a

little difficulty in getting the fifteen weeks; in fact it is impossible to get the last fifteen weeks within the twenty, but a considerable part of it I think they do. I believe they can qualify within a period of twelve months after attaining the diploma.

52,404. *The Chairman*: In the middle of page 27 of your note of evidence, under the heading of "Research," you detail the four Institutes at which research regarding the diseases of animals is at present prosecuted. You tell us that, in the main, these Institutions are financed by grants allocated through the Ministry of Agriculture?—That is so.

52,405. What is the original source of those grants?—So far as I understand, it is from the Development Fund.

52,406. Is it the Ministry that makes the case to the Development Commission for these grants, or do you as a College play any part in making the case for the grant?—The College applies through the Ministry of Agriculture for the grant.

52,407 You have no direct dealings with the Development Commission?—None whatever.

52,408. Is there any body or group which seeks to allocate research as between these four Institutions so as to avoid overlapping?—I do not know about that. I have supposed that in that the Ministry were advised by their late Chief Scientific Adviser; but I do not know.

52,409. You have, no doubt, studied at length the problem of immunisation against rinderpest. The Commission has heard a great deal of evidence bearing upon the two methods of serum-simultaneous and serum-alone. Have you any strong views on the relative merits of those two systems?—I have views, though I have no practical experience of immunising cattle in this country in that way. I did not think there was any room for difference of opinion about the two methods. It seems to me that the serum-alone method is specially applicable to the actual stamping out of an outbreak where there is little apprehended danger of its recurrence; but in a country in which the disease is enzootic I should think it was generally better to employ the simultaneous method.

52,410. Its usefulness, even for the first purpose you mentioned, namely, dealing with a local outbreak, is somewhat limited, is it not, by the fact that the method only conveys nine days of immunity?—That is the reason why it is, by itself, defective if there is any apprehension that the disease may still be existing in the neighbourhood at the end of that short period; but there are many cases in which, if serum is abundant and cost is not a matter of great moment, the serum-alone method can be used quite successfully, but it would have to be repeated at intervals of perhaps ten days or longer.

52,411. Have you any views to give us as to the feasibility of mass immunisation by the serum-simultaneous method in a tropical country?—No. I should not care to express any opinion about that, because I only know the theory of it, and circumstances in different countries might greatly affect the best method of working.

52,412. One of the existing disadvantages of the danger of the serum-simultaneous method is, I think, that organisms other than those intended to be introduced into the body are often carried in with the serum?—Yes, carried in with the blood rather than with the serum.

52,413. With the immunising blood?—Yes, with the blood used to immunise.

52,414. Is that a danger which you would expect to be removed with improved technique and further research?—I should have thought that was a danger which could often be averted, if possible by obtaining animals that were not infected with red water and these other diseases; I mean the animals which furnish the blood.

Sir John MacFadyean.

52,415. Or by using animals not subject to those particular diseases?—Yes.

52,416. Is the principal of the serum simultaneous method used in this country for any purpose?—No. I cannot at the moment remember any case in which it is employed. It has, of course, been recommended and employed in some other diseases, swine fever for example, and in swine erysipelas (which is an important disease in this country) an exactly similar method is employed, except that usually instead of blood it is an artificial culture. But in swine fever, or hog cholera as they call it in the United States, millions of pigs have recently been done by the simultaneous method.

52,417. There is the fact, is there not, that rinderpest organisms cannot be grown on artificial media?—No. Swine fever and rinderpest are exactly the same in that respect.

52,418. *Sir James Mackenna*: There is one point about which there is a good deal of difference of opinion in India, and that is whether cattle-breeding should be under the Veterinary Department or under the Agricultural Department. By "cattle-breeding" I mean cattle improvement and that sort of thing. Have you any views on that point?—I could not say. I think there might be an advantage in having it under veterinary officers. They certainly would need to be very specially selected.

52,419. And they would need to have an agricultural bent?—Yes, of course. They would have to have a good knowledge of agriculture in general in India. What I am thinking of is that they would have to specialise just in breeding and in the laws of heredity, and so on.

52,420. What would be the advantages of a veterinary officer over an agricultural officer in regard to the matter?—As a rule the veterinary officer would have had a better education in physiology than the agricultural officer. That is an important subject of study in his ordinary course. But I do not think there would be any great advantage; I only say there might be on that account. The great improvement which has taken place in breeds of animals in this country has been brought about independently of the assistance of the veterinary profession.

52,421. I think you have been to Muktesar?—Yes.

52,422. What do you think of Muktesar as a centre of veterinary research for India?—I think it would be difficult to find a better centre in India. I think continuous research in the plains of India would be very difficult.

52,423. You also know Bareilly?—Yes.

52,424. Do you think research would probably be impossible all through the twelve months of the year there, or when the temperature was at about 112?—I think during that period it would be very unsuitable for work, but I suppose that does not last for more than two or three months.

52,425. Muktesar has increased its output enormously since your visit, as you know?—Yes.

52,426. It got a great stimulus during the war, and it has kept it up. The question under consideration is whether research work should be taken away from Muktesar and concentrated in some other part of India, leaving Muktesar as a serum manufacturing institute, with research subsidiary to it. You are doubtful about the possibility of continuous research on the plains?—My opinion is very strong that that would be a wrong step and that there would be great disadvantage in transferring the work to the plains on account of the temperature; and the isolation of Muktesar is, of course, an advantage.

52,427. And a great disadvantage too?—It is a great disadvantage in getting there.

52,428. And it is very difficult to keep your staff there?—Yes, I know it is, but if India were vacant of research institutions now, and you had to find a place, I should still advise Muktesar rather than a place on the plains.

52,429. *The Chairman*: What about other and less inaccessible hill stations?—If you can find one which is in all respects equal to the present one, and is more accessible, that is an advantage, but it would be a serious thing to abandon Muktesar, which is a very fine institution. When I was there I thought the proposal was then to have a good deal of serum manufactured at Bareilly during the Winter months.

52,430. *Sir James Mackenna*: We were more concerned with research. With regard to this question of veterinary education in India, you know that the services have been provincialised. You think there would be no difficulty, if veterinary colleges in India met the qualifications laid down by the Council of the Royal College of Veterinary Surgeons, in accepting a qualification equivalent to the M.R.C.V.S.; or would it be possible for colleges in India teaching up to the standard accepted by the Royal College of Veterinary Surgeons to be affiliated and hold an examination in India?—No. I do not think it would be possible to have them affiliated to the Royal College of Veterinary Surgeons.

52,431. The rules about that are very strict, are they?—I think the utmost concession that could be expected would be that they would admit a student to, perhaps, the Final Examination here after a period of study in this country, very similar to what they do in some other cases. I think the Royal College of Veterinary Surgeons is quite right in being very particular about uniformity.

52,432. So that, even if one did get a college teaching up to a fairly high point in India, you still think that a course at home would be necessary before taking the diploma?—I think it would be necessary; advisable, anyway.

52,433. If the Government of India decided to give a qualification of its own to the Indian Colleges, a Veterinary Science diploma or whatever they called it, how would that stand in the veterinary world, do you think?—I do not know. It would, of course, be a matter concerning India alone, but I am very doubtful whether it would be considered equal in status to that of the diploma granted in any European country. I think there would be a chance that it would also, from its isolation, tend to retrogress.

52,434. There is another point. As you know, in the case of export of cattle to some of our Colonies, the entrance of those cattle is prohibited unless they have a certificate signed by a Member of the Royal College as to immunity from tuberculosis and other things. It is possible, is it not, that if this Indian diploma were given it might not be accepted by these countries?—It is possible, certainly.

52,435. Which would be a serious handicap on the export of cattle?—Yes. They could, of course, appoint special officers at the ports.

52,436. They might appoint a M.R.C.V.S. at the port?—Yes.

52,437. That would be rather derogatory to the importance and dignity of the veterinary profession in India, would it not?—Yes. My strong opinion is that it is to the advantage of India that men who have to carry out veterinary work should be thoroughly conversant with veterinary science in Europe.

52,438. I think your experience of Indian students has been fairly good, has it not? You have had some very good Indian students?—Yes.

52,439. You have one at present?—Yes, we have one very good student.

52,440. As you say, there are all sorts of grades of men, whatever their nationality?—Yes.

52,441. *Professor Gangulee*: You have said there are five veterinary colleges in this country?—Yes.

52,442. How many veterinary schools have you?—The word "college" used in that connection means the same as "school."

Sir John MacFadyean.

There is a little confusion on this account, that four of those institutions are not called schools; they are veterinary colleges. The Royal Veterinary College was the first to be founded, and then the others came in succession. One of the institutions devoted to teaching calls itself a school. That is the one connected with the University of Liverpool; but the others are denominated colleges. There is a little confusion, because the Royal College of Veterinary Surgeons is not a school but the corporate body, but it is often confounded with the other institution here in London, the Royal Veterinary College.

52,443. So that particular veterinary college in Liverpool is not under this corporate body?—Yes. We (meaning the Royal Veterinary College, of which I am the Principal) are not under the Royal College of Veterinary Surgeons in any sense of the word, except that if we want our students to obtain the diploma of the Royal College of Veterinary Surgeons we must teach according to the prescribed regulations of the body; but otherwise they have no control over us at all.

52,444. The advantages, I take it, of having the control of veterinary education in the hands of a corporate body is to standardise your curriculum?—It is to standardise it and, if possible, to raise it, the latter being perhaps the more important.

52,445. Do you think such a corporate body in India would be advisable?—I do not know how you would set about constructing it.

52,446. Just as you have five veterinary colleges here, we have eight different provinces having their own veterinary colleges?—I think it would be impossible to construct a corporate body, with duties like those which the Royal College of Veterinary Surgeons have, out of the existing teaching colleges in India. At any rate, that would be entirely different from the system in this country, because the veterinary colleges in this country (meaning the institutions which are engaged in teaching) have nothing to do with what may be called the management of the profession. The necessity for the creation of the Royal College of Veterinary Surgeons arose because one could not trust the existing colleges to have a uniform diploma, or to make any attempt to raise the standard of it. The selfish interest of veterinary schools is to obtain as many pupils as possible. The purpose of the Royal College of Veterinary Surgeons is to endeavour to provide the country with the necessary number of Veterinary Surgeons educated up to the highest possible pitch which the existing circumstances will permit.

52,447. There are four institutes at which research regarding the diseases of animals is being conducted now, are there not?—Yes.

52.448. What is the link between those Institutions and your veterinary Colleges?—In some cases there is no link whatever. At Cambridge, for instance, there is none. At London, under the existing arrangement, there is practically none, except that the buildings are contiguous, because the Ministry of Agriculture and the Commissioners of the Development Fund forbid those who are working in the Research Institute, and are paid for that purpose, to engage in teaching. Therefore we have entirely separate staffs, except that at the present moment I happen to be Director of both institutions.

52,449. *Sir Thomas Middleton*: That is a pretty big exception, is it not?—No, I do not think it is very important. I think it is never likely to be repeated, because the work of the Research Institute, as you know, has grown greatly within the last few years, and it is far beyond the power of any one man to grapple with the two. I do think it is a mistake that the Commissioners of the Development Fund have laid it down, hard and fast, that there is to be no teaching by the research staff. I think there should be a certain amount of teaching, because it is only in that way that you

can associate the education with the research, and I think probably the rule to which I have referred will be abandoned.

52,450. *Professor Gangulee*: If that is the situation, how do you co-ordinate certain items of research being conducted in your institutions with those conducted in the research institutions?—They are not co-ordinated now. The research is in one building and the education is in another. The original buildings were constructed purely for education.

52,451. Are we, then, to understand that in the veterinary colleges you do not carry on any research?—It depends on what you call a college. This building, which is devoted to research, is called "The Research Institute in Animal Pathology, Royal Veterinary College." It is like two parts of a building assigned to different duties.

52,452. I think you have, in this country, cattle testing stations which are controlled by your colleges?—No, there is no actual testing station at present in this country. There was one under the Ministry of Agriculture, but it was abandoned.

52,453. What percentage of the students who come out of your Colleges are employed by the Ministry, and what percentage practise privately?—I think the Ministry employs altogether about 150 out of 4,000.

52,454. So that a large number of them are private practitioners?—Yes. 80 per cent. of them are private practitioners.

52,455. *Mr. Calvert*: To what extent are the students from your college who have received the M.R.C.V.S. diploma competent to carry out research without further study?—Perhaps one in two hundred; or, may be, the proportion is even smaller.

52,456. So that if we were trying to set up and develop the research side in India, we should have to try to get men with some additional qualifications. If we try to recruit men for research in veterinary matters in India we shall want men with some rather better qualification than the minimum?—Naturally, much higher.

52,457. The veterinary officers in India are pressing for a Veterinary Adviser with the Government of India. Have you any opinion at all on that matter?—What are to be his duties, may I ask?

52,458. To advise the Government of India on all veterinary matters that come before it?—Including research?

52,459. Including research as carried on under the Government of India. At present the advice is tendered through the Agricultural Adviser?—I frankly admit that I think, if they get the proper sort of man, a Veterinary Adviser would be much better than an Agricultural Adviser to give the advice, assuming that the latter is highly competent to give advice on agriculture in general; but, if veterinary education includes research, it demands a very great deal of highly specialised knowledge; in fact I should think it would be probably be rather difficult to get proper men to act as Veterinary Advisers if the office fell vacant frequently.

52,460. Actually, in England the veterinary advice seems to be submitted through Sir Daniel Hall, an agricultural specialist, does it not?—I do not quite follow that.

52,461. In the Ministry of Agriculture, the veterinary advice is tendered to the Minister through Sir Daniel Hall, is it not?—No, surely not; I do not think so. I should very much regret to learn that that was the case. The late Sir Stewart Stockman was the Ministry's Chief Adviser, and I should have thought he was also the Veterinary Adviser on all matters which might be termed strictly professional, such as advice on how to deal with outbreaks of disease. I do not think Sir Daniel Hall had anything to do with that.

Sir John MacFadyean.

52,462. *Sir Thomas Middleton*: You have told us that you do not think the Royal College of Veterinary Surgeons would be prepared to recognise Indian students unless they came to this country for study?—I said I thought they would not recognise the diploma as equivalent to their own.

52,463. Would it be possible for the Royal College of Veterinary Surgeons to conduct an examination in India as they do in this country?—No, quite impossible.

52,464. Because of the difficulty of sending out practical examiners?—Quite so.

52,465. Does a member of the Royal College of Veterinary Surgeons, if he goes to America to practise, require a fresh qualification?—Yes, I believe he does now in most States. He does, even if he goes to Canada.

52,466. Does that qualification amount to anything more than paying a fee?—Yes, to much more than that. It means having to be re-examined by a Board.

52,467. So that in practice the diploma of the Royal College of Veterinary Surgeons is now limited to certain parts of the British Empire only. Canada imposes its own diploma?—Yes.

52,468. Can you tell me what the position is in Australia?—I think a Veterinary Surgeon who has the diploma of the Royal College of Veterinary Surgeons is allowed to practise there without further examination.

52,469. And similarly, probably, in New Zealand?—Yes. New Zealand has no veterinary school.

52,470. Canada is the first part of the British Empire to institute a separate qualification?—Yes.

52,471. Each of the European countries has its own qualification. Small countries like Holland and Belgium each have their own qualifications?—Yes. They have got what amounts to actually a State diploma.

52,472. Is there any reciprocal relation between different parts of Germany, for example. If a man takes a Prussian diploma can he practise in Saxony?—I do not think there is any distinction there.

52,473. Any man who holds a Prussian diploma can practise throughout Germany, can he?—I think so.

52,474. Is there any reciprocal relation between France and Belgium?—No.

52,475. The cattle disease problem in India is vastly greater than it is either in Holland or in Belgium?—It is vastly more difficult.

52,476. It would seem that India must find some way of qualifying its veterinary surgeons. We cannot possibly send over to London the number of men who require qualification to deal with the cattle of India. It would be physically impossible?—India may just have to be content with men having a lesser qualification.

52,477. Another qualification we will say?—Yes, even though it is not so good. It is conceivable that in India it will be very many years yet before the administration in connection with cattle diseases will ever approach what it is in a European country. There could be no administration in this country without having veterinary practitioners dotted all over it. Therefore it is very difficult to say from what is done here, and the experience in connection with disease, what it would be best to try to do in India.

52,478. From what you have said, I think you will probably agree that we want veterinary surgeons of different types of calibre in India. We ought to aim at a high qualification, but we must be content with a great many practitioners with a relatively low qualification?—Yes. It might be the same, for instance, as it is in this country and throughout Europe

with regard to inspection of meat. The inspection of meat is in the hands of members of the veterinary profession in the sense that they direct the slaughter houses and that they are actually responsible for the condemning or for the passing of meat; but everywhere there are large numbers of men who are not veterinary surgeons but who are just qualified to do the initial work of picking out meat which is grossly diseased and stopping it being sold.

52,479. You think we might well apply something of the same system in dealing with this great problem of cattle disease in India?—I think that will be unavoidable. I think that India should have, at the top of its system of dealing with disease, men who are in no respect inferior to those employed in Europe. That is a matter of first importance; but that after that they should gradually work up the education of the men who are, so to speak, to be concerned with the details of the matter.

52,480. We have been talking about qualifications, and about the diploma required. We might now get to the syllabus of instruction. It takes your men four years to qualify after passing the matriculation, I think?—That is so, three years and ten months.

52,481. In one of the veterinary colleges in India which I have in mind, they have the same entrance qualification of the matriculation examination, and then they have a four years' period of study. The criticism of the teachers of that college is that the course is not long enough. It is obvious why a four year period in that particular case is not long enough, although it may be sufficiently long in your case. The reason is the difficulty of studying veterinary subjects in a foreign language, English?—I think that must have been the only reason.

52,482. That was the given reason. In that particular college they are anxious to raise the standard of entrance to that of the first science examination of the University, and to give four years' technical training after that. This would mean a six-year course. You have had a long experience as a teacher. What do you think should be the result of taking intelligent students and giving them a four-year course in veterinary science after a two years' general science course?—I think it ought to be very beneficial.

52,483. Would not you expect to get well qualified veterinary surgeons, if they selected their men carefully?—I should think they would get very few people. I was going to ask what would be their remuneration when they qualified in six or seven years.

52,484. Six years?—But one has to make allowance for rejections in any class of students, which would probably extend the average to seven years. But taking six, I can only say that it would not be applicable in this country at the present time. I think it would be very desirable if you could insist that every intending veterinary surgeon should first qualify at a University in Arts or Science, but it is not practicable.

52,485. Assuming that the salary difficulty was got over, and that the course was arranged, such a course ought to give you very highly trained veterinary surgeons, ought it not?—Yes. It might not be open to impeachment at all, but, of course, first you must have a syllabus to work with. You must have a prescribed course of study. After that it is the men who teach which constitutes the important thing.

52,486. The syllabus is constructed very much on the lines of your own syllabus in this country. That represents the aim of those who are trying to make the highest grade practitioner. What would you suppose would be the essential period after the matriculation for a lower grade practioner? Would you say three years?—Yes, I think that would be ample. It would be necessary not attempt to go too far into some subjects. They would have to be of rather a more elementary grade than what the

ordinary student gets. For instance, the students spend a lot of their time in connection with practical chemistry and practical physiology and practical pathology. Probably all that would be omitted, and I think you would make very serviceable second grade veterinary surgeons in three years.

52,487. Have you discussed this question of the curriculum with any of your colleagues who have come back from India?—No, nothing more than casually.

52,488. You cannot tell us of any of them who have given special thought to the subject?—No.

52,489. *Dr. Hyder*: On the first page of your note of evidence, you say that the Council of the Royal College of Veterinary Surgeons fixes the minimum standard of the intending students' general education. Can you define it in terms of some examination of the different Universities?—The Council of the Royal College of Veterinary Surgeons fixes everything in connection with education, in this way: that it decides what educational certificates the intending student must present.

52,490. What are those?—There are about 50. They are those which are accepted by the General Medical Council for admission to the study of medicine.

52,491. At present, have you many students from the Colonies and Dominions?—No, I believe only a small number and a declining number. Two or three veterinary colleges have been started in Australia within comparatively recent times, the two principal ones being at Melbourne and Sydney. I believe there are very few such students attending here, for much the same reason as was referred to with regard to India, that there is little room for private practice there, and students therefore will not come in large numbers because they do not see how they are going to make a living.

52,492. What is your opinion as to the efficiency of these colleges that are established in the Dominions, say in Australia?—I am afraid I am not in a position to say much about that, except what I know about the staff: they have got good staff and the courses of instruction are very much the same as those prescribed in this country.

52,493. Are the courses of instruction at the veterinary colleges in India of the same standing?—No, I do not think they could be regarded as of the same standing as the staff in this country from what I know; but I am not in a position to say much about that.

52,494. The gentlemen who do the teaching in Australia are members of this Royal College of Veterinary Surgeons?—Yes.

52,495. Or are they men who have been trained in Australia?—There has hardly been time for that yet; eventually that is what it will come to: the colleges will create a profession in Australia, and then the staff will be recruited from that profession.

52,496. *Sir Henry Lawrence*: At present, is the teaching staff in Australia recruited from the College of Surgeons here?—Yes, I think the majority are. The Principal of the College certainly is; he was a member of the staff of the Royal Veterinary College in London. I think there are already some junior members of the staff who have actually graduated in the College; but the College in Melbourne, for instance, was founded in connection with the University by taking over a private school that had long been in existence there. A veterinary surgeon started the Veterinary College and he carried it on for about 50 years; then the University took it over and it is now called the Veterinary College or School of the University of Melbourne.

52,497. How many years has that been in existence?—You mean since it was taken over by the University?

52,498. From the beginning and from the second stage?—About 60 or 70 years, I should say, since it was started.

52,499. And how long since it was taken over by the University?—Less than 20.

52,500. *Dr. Hyder*: Have you any students from the Argentine here studying at this Veterinary College?—We have not at the present moment; we have had.

52,501. Is there a good deal of disease amongst cattle in the Argentine?—I do not know anything about that; I know that some diseases that are common in other parts of the world are also very common in the Argentine, but I do not know anything personally about disease in the Argentine.

52,502. Do you give any instruction so far as tropical diseases of cattle are concerned at these Colleges?—Yes, all diseases have to be dealt with, at least theoretically; but at the present time one cannot deal with them practically. I do not know whether it would interest the Commission to know that about 20 years ago a special course of post-graduate study was started at the Royal Veterinary College; it was largely conducted by myself. It was a two months' course which was held twice a year, and men came from all parts of the British Colonies to get instruction in that course, which dealt principally with tropical diseases. It was a very expensive course to run because one had to keep up here such diseases as piroplasmosis of horses and cattle and half a dozen different kinds of trypanosomiasis solely for the purpose of demonstrating these diseases to the students. Altogether, certainly over 200 men came to attend these courses and went back to the different parts of the Empire to work. But these courses came to an end in 1914, and it has been impossible to start them again, in spite of frequent applications, because the existing staff is unable to undertake the work. That is owing to the division of the staff into the research part and the teaching part and the fact that the research staff is not allowed to engage in teaching. I think that is a very great defect which must be remedied, because it is the men in the research staff who are precisely fitted to give post-graduate instruction.

52,503. Your graduates who at present go out, say, to the Crown Colonies or India, possess, perhaps, a theoretical acquaintance with these diseases?—That serves as a basis only; on that they can build as the result of their experience. They can be very well taught here with regard to the theory and the practical part such as microscopic examination, and so on, but, of course, a man's education in anything is not perfect until he has attempted to put it into practice, and we cannot show them the contagious diseases actually in the horses and cattle, and so on, in this country.

52,504. Is there any cure for surra?—I do not know; the remedies are constantly being changed and tried and some of the quite recent results are very promising.

50,505. What do you think of Bayer-205?—Of course, that is the most recent; I know the research quite well, and I had that in mind when I said it was very promising.

52,506. *Mr. Noyce*: Given the necessary staff and equipment, do you think that veterinary research can be concentrated in one institute in India; I am looking at it purely from the point of view of animal disease?—Certainly; I think it would be much better in the meantime to have it concentrated in one rather than to begin to be too ambitious and think about setting up four or five, because any such proposal would raise in one's mind the wonder where you are going to get the research staff. There is not one person in fifty who is any good for research, and nothing could be more dreadful than to have institutions set up for research and not properly staffed.

52,507. You do not think diseases in a sub-continent like India present different features in different parts?—It is not so much the features: the diseases are different. You have got many of the diseases of course that we have here, but then their worst diseases are non-existent here: cattle plague, surra, and so on.

52,508. All the diseases that there are in India can be sufficiently dealt with from one centre?—I think so, certainly.

52,509. If a Canadian veterinary surgeon comes over here, can he practise on his Canadian qualification, or has he to take out a new qualification?—He would have to take out a new qualification; he would have to apply to the Royal College of Veterinary Surgeons and ask what concessions he would be allowed. He might be told, as some have been told, that if he would attend specified classes in this country at one of the veterinary colleges he would be admitted to the final examination, and if he passed our final examination with the other students here, then he would be given the diploma. In some other cases the student is asked to attend two years, or, at any rate, to be examined in subjects that belong not only to the final year but also to the third year.

52,510. No veterinary surgeon with any qualification other than that of the Royal College of Veterinary Surgeons may be admitted to practice in England without undergoing your final examination?—Yes, anyone is allowed to practise in this country as a veterinary surgeon, or at least, to practise treatment of animals; the Veterinary Surgeons Act does not prescribe treatment; it simply guards the title "Veterinary Surgeon." It comes to nearly the same thing. If a veterinary surgeon comes to this country for practice, he is not allowed to state in writing or any other way that he is a veterinary surgeon until he becomes a member of the Royal College of Veterinary Surgeons.

52,511. He can call himself a veterinary practitioner?—No, he must not do that either; he must not use any name, title or designation stating that he is a veterinary surgeon or specially qualified to treat animals.

52,512. Then the position is really as I stated, that he could not practise here without undergoing your final examination?—It is not exactly as you state it, because I regret to say that there are a considerable number of men who are actually practising here without a diploma and without calling themselves veterinary surgeons; they are the quacks that are common in every country; but that is the only exception to what you say.

52,513. *Professor Gangulee*: How does the standard of your veterinary colleges here compare with that of other European countries such as Denmark, for instance?—I think it is very much on the same level.

52,514. Do your research workers keep in touch with what is going on in Europe in different research stations?—The research worker who does not do that is not worthy of the post that he occupies, and in my opinion no one is fit for research, born in this country at any rate, until he can read at least two other languages, in order to keep himself abreast of advances in science, namely, French and German.

52,515. Would you prescribe similar qualifications for a research worker in India?—I do not pretend to prescribe what need be necessary for India, because it is the difficulty of deciding what is attainable rather than what is desirable; but I certainly think that in India, just as in this country, no one engaged in research would be abreast of the times for more than two or three years if he was not able to read the German and French publications regarding the results of research in those countries.

52,516. *Sir Thomas Middleton*: You have made a strong case for associating teaching and research I think. When Mr. Noyce asked you

if you would confine research in India to one institution, you said you thought it would be quite enough to have one institution. Now, we have five veterinary colleges in India; why should they not take part in research work?—Because I think the teaching colleges in India are not staffed in a way to make them good research institutes. It is far more difficult to start a research institute than it is to start a teaching institution; that is my opinion. I think, however, that if the colleges, whose main business it is to teach the ordinary students now engage in research, it would be better that they should abandon it if they are devoting any portion of their time to it, but that some post-graduate teaching should be organised at Muktesar; I think that would be a good thing, not for the whole of the students who are to serve in the secondary veterinary service, but for the most promising men.

52,517. Do not you think that the fact that research work is in progress in an institution is of great advantage to that institution in its teaching?—You would practically have to found a new set of buildings.

52,518. Buildings are not the difficulty in India: it is the men?—But you have got to have the men as well as the buildings. I mean you cannot carry on research in a little laboratory that will only hold guinea pigs; research regarding animal diseases requires a great deal of apparatus at the present time. It is just as difficult as research regarding human disease. The idea that a veterinary teacher who has a little time on his hands should spend that time in what is called research, would not work out well. But it is especially with regard to the training of students who have come here from the Colonies and from India that I think it is a misfortune that at the present time the research staff is not allowed to give instruction.

52,519. *Mr. Noyce*: What are the reasons for that? Have you any idea?—I think it was because it was thought if it were allowed it would be abused: that schools to which research institutions were attached would use the research staff for teaching the ordinary students although they were actually getting special fees for that; I think that was probably the reason. But they are not allowed to teach at present, even supposing they get no pay.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Tuesday,* 14*th June*, 1927.

Tuesday, June 14th, 1927.

LONDON.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } (*Joint Secretaries*).

Sir PATRICK FAGAN, K.C.I.E., C.S.I.

MEMORANDUM.

1. I entered the Indian Civil Service in 1886 and went to India in 1887. Except for a short period in Rajputana, the whole of my service was passed in the Punjab. For the first ten years I was chiefly engaged in land-revenue settlement work, with occasional charge of a district as Deputy Commissioner. From 1900 to 1908 I worked continuously in the latter capacity with a brief interval in the provincial secretariat. From 1909 to 1915 I was Commissioner of a division, and from 1916 to my final departure from India in 1922 I was Financial Commissioner in the Punjab.

2. I propose in this memorandum to confine myself, as far as possible, to matters of opinion and suggestion, assuming that the relevant facts will be sufficiently known to the Commission. I am tempted to note here that the mass of matter relative to the agriculture and rural conditions of India already available in literary and statistical form, whether in official reports, especially those relating to the settlement of land revenue, or in gazetteers or in other works, is immense, though it requires to be digested and co-ordinated.

The application of my remarks is in the main restricted to the Punjab, the only province of which I have any degree of intimate personal experience.

3. The agricultural problem in India is in the main one concerned with a vast mass of peasant proprietors and peasant tenants cultivating small, and in many cases, minute holdings under an agricultural technique which, while during the past thirty years it has shown itself capable of progress, is on the whole the outcome of, and adapted to, primitive economic conditions under which extensive rather than intensive cultivation, coupled with pastoral pursuits, was possible and desirable. The normal growth of population under settled political and progressive economic conditions, combined with law and custom by which the land of a deceased proprietor or

occupancy tenant passes to all his agnatic heirs jointly and not to one of them, has necessarily resulted in increasing morcellement of holdings. With little or no diversification of industrial openings the growing rural population has had to look to agriculture for livelihood, with the result that the mass of manual labour at present seeking to live by, and in fact dependent on, cultivation is, in the more densely populated tracts where the agricultural problem is most pressing, in excess of the quantity which land can profitably utilize in proportion to the quantity of capital at present ordinarily applied. In short, the law of variable proportions, which governs the employment of the factors of production in agriculture no less than in other industries, is being more or less seriously transgressed, and the diminishing return to labour, under existing agricultural conditions, is making itself more or less acutely felt. The redundant labour, if fully employed, yields no adequate additional product; otherwise it works for less than full time. In either case the product per man tends to be insufficient.

4. A remedy in the direction of any spontaneous modification of the existing laws of succession or inheritance within any visible period seems to be highly improbable, and indeed such a measure would by itself be of little use in the absence of a growth of diversified industries to which landless heirs could resort. The true remedy appears to lie mainly in two directions: (1) the application of more capital, with its necessary implications; the wider application of science to Indian agriculture and changes in the class of crops now usually grown on small holdings; (2) the organisation of industries supplementary to agriculture. Both developments would provide an outlet for the labour which is now redundant under the present comparatively primitive conditions of agriculture in India.

It must, of course, be recognised that there has been a large application of capital during the past fifty years, but it has taken place mainly through the efforts of the Government. Every canal that has been constructed, every railway that has been built, has been an application, indirect indeed so far as the cultivator has been concerned, of capital and science to agriculture, the most important industry of India. What is now needed is increased direct application by the cultivator himself, coupled with, and indeed based upon, his recognition that agriculture must in future be on a commercial rather than on a self-sufficing basis, and that the true sphere of his industry is to serve the community, with a full remuneration for himself, rather than merely to satisfy his own immediate bare necessities.

5. The above sketch may serve to indicate what in my opinion are the main direct factors in the future prosperity and welfare of the Indian rural population, and the main broad lines of progress which should be followed. They are:—

(1) Increased and scientific investigation of Indian agricultural and veterinary conditions in their technical, economic, and commercial aspects.

(2) The communication of the results to the cultivator in practical shape by a system of agricultural education of a technical character, inclusive, of course, of practical demonstration on an extensive scale, and based on a system of general education framed with a view to training intelligence rather than to providing a store of more or less firmly memorized facts.

(3) A healthy system of credit for the provision of capital.

(4) The encouragement of industries, as far as possible of a domestic type, supplementary to agriculture.

(5) The encouragement of rural co-operation in all its branches.

To the above factors should be added, of course, the form and incidents of land tenure, a consideration of special importance and of special com-

plexity in many parts of India. But as it is excluded from the scope of the Royal Commission's terms of reference, it is not possible to deal with it here.

6. I assume, of course, a continuance of political stability and the maintenance of a high standard of efficiency in civil administration, especially in the districts, together with an adequate development of public works in the provision of communications, irrigation canals, &c. Without these essentials agricultural progress is emphatically out of the question.

7. There are certain other general controlling or inhibiting factors which in the past have made for, and still continue to make for, defective productivity on the part of the Indian cultivator—his moral and mental outlook and the hampering effects of some, though by no means of all of his religious traditions and prejudices. They demand clear recognition, though it is scarcely possible to deal with them fully in a memorandum such as this. Their effect may be summarized in the statement that they have induced in the mind of the ordinary small cultivator, guided and controlled, as he is, by centuries of tradition, a non-economic view of his daily work. He has been content with a more or less bare subsistence in place of striving after progressive material prosperity. As an obvious example may be cited the Hindu's religious veneration for the bovine species. This practice, however, admirable from certain points of view, unquestionably has a very harmful effect on the quality of Indian cattle and on their place and use in the agricultural economy. It operates to exclude the Indian cultivator from the benefits of a mixed system of farming in which crops and animal products both play a more or less equally important part. But education and wider external social, moral, and economic contacts are gradually relaxing some of these trammels, and in parts of India the process of change has been at work for a considerable period. There are districts of the Punjab in which the period of my service has seen a great expansion in the economic outlook of the peasant. Very much, of course, still remains to be done, but the changes which have occurred are sufficient to show that rural India is by no means irretrievably stagnant.

8. Turning to the factors noted in paragraph 5 above; agricultural and veterinary research must hold the primary place in any efforts to render Indian agriculture more productive and Indian rural life more prosperous. The facts to be investigated are so numerous and complex, the regional and local conditions so diverse, that widespread, systematic, and co-ordinated work in this direction is the indispensable foundation for any material improvement. The stage which has been already reached is clearly shown in the Review of Agricultural Operations in India for 1924-25, which has been recently published. It is clear that a large area has already been covered, but a vast field still remains untouched, and it seems manifest that the work of the Agricultural Departments, if it is to be effective within a measurable period, demands a substantially greater net annual expenditure than Rs.82 lakhs, the recent figure.

Whether the position of agriculture as a "transferred" subject will or will not have a prejudicial effect on its development remains to be seen. If there should ensue a total disappearance of Europeans from the staff, as seems not unlikely, the result will indubitably be deplorable, even though the departments, as is the fact, include many able Indians of high qualifications. The transfer has of necessity impaired the responsibility of the Government of India for the development of agriculture in the provinces, and also its power to discharge that responsibility. The presence of a central energizing and co-ordinating agency in a comparatively early stage of agricultural progress, such as the present, is very desirable, and its disappearance is to be regretted. At the same time the transfer will allow full scope for adequate treatment of varying local conditions, provided always that the provincial ministers, and the legislative bodies to which they are

responsible, sufficiently appreciate the vital importance of agricultural development to the welfare of the country.

9. While fully recognising the general importance of all the matters on which the Agricultural Departments are concentrating their efforts for purposes of research or otherwise, there appear to be certain directions to which attention might be specially directed. One of these is the investigation of the possibilities of a widely extended dairy industry and its encouragement. There seems to be much scope in this direction. At present the small peasant proprietor of the Punjab with a small holding of a few acres tries to cultivate it on lines applicable to a comparatively large area, though a more intensive mode of cultivation would suit the needs and conditions of the small holder a good deal better. Here there seems to arise a chance for dairy industry combined with tillage. Milk and *ghi* are articles for which the ordinary Indian dietary creates an immense demand, while in urban areas these essential commodities are generally scarce in quantity, inferior in quality and high in price. Why should not the small cultivator, within ten or twelve miles of a town, combine the growth of cotton, or wheat, or oil seeds with dairy industry, producing *ghi* and milk from mainly stall-fed cattle, the manure of which, if properly treated, would be highly beneficial to his crops? Such a practice would involve the devotion of more land to valuable fodder crops, and to pasture. By pasture is not meant, of course, the mere uncultivated waste known in the Punjab and elsewhere as *banjar* and generally dignified, though quite undeservedly, with the name of *chiragah* or pasture. The latter is in fact land to which neither capital nor labour is applied, whereas true pasture, of course, would be real grass land and the object of reproductive expenditure on manure, irrigation, &c.

Under some such system the cultivators' milch cattle would be fed on the fodder crops, would graze and exercise on the pasture, and would supply good manure both for the pasture and for the crop area. No doubt each cultivator would have to work on a small scale, but here would come in the value of agricultural co-operation. The pasture of several individual cultivators could probably without much difficulty be thrown into extensive blocks to be used in common, while the collection of milk and the preparation of *ghi*, and their despatch to market for sale to dealers and consumers in the large towns and cities, would be a co-operative process. In this way an important and supplementary agricultural industry could gradually be built up, which would be profitable to small landholders and farmer-cultivators and of great benefit, both economically and physically, to the urban population. It is a matter for enlightened enterprise and co-operation on lines which have produced remarkable results in Denmark and elsewhere. In this connection it cannot be forgotten that the experience both of Europe and America seems to show that for the success of agriculture, prosecuted on a small or on a medium scale, a combination of crop production with cattle breeding or dairy industry is almost indispensable. The breeding of cattle for consumption as meat-food is, of course, out of the question in India, at any rate within any measurable period of time. The possibility of a dairy industry, such as that suggested above, obviously depends largely on the success of veterinary investigation and effort in producing breeds of cattle which will provide good draught bullocks as well as profitable milch cows. The Veterinary Department, it is understood, is concentrating attention on this problem.

10. The fragmentation of the cultivator's holding contributes greatly to the waste of his time and labour. By fragmentation is meant the separation of the land operated by one cultivator into several more or less minute blocks separated by long distances. Its origin is to be found in the joint ownership of land which is so common in India. Such ownership is frequently broken up by partition, as a result of which each previously joint owner receives as his separate property a defined portion or lot of the

property owned. It frequently, or generally, happens that each party to such a partition insists on securing a plot of each distinct class or kind of land included in the previously joint holding regardless of its situation. The result is that in the more thickly populated parts of the Punjab a cultivator in many cases has to carry on his business on eight, twelve, or even more small fields, all separated from each other by greater or less distances. A somewhat similar state of things existed, of course, in England in feudal times, though in the course of two centuries or more it has disappeared. That immense waste of time and labour is involved is obvious. The consolidation of such scattered holdings by a process of exchange so as to substitute for a holding thus divided and comminuted a good sized continuous area of land is one of the most pressing agricultural and economic necessities of the Punjab and, I doubt not, of other parts of India also. Shortly before I left India, this work had been taken in hand by the Punjab Department of Co-operative Societies under its Registrar, Mr. Calvert, and at the time of my departure the results obtained were most promising. A simple legislative enactment, on permissive lines, would probably be of great assistance in the further prosecution of this most necessary development. While excluding the intervention of the regular law courts it should provide for the exercise of compulsion in the case of an obstructive minority.

11. It is needless, of course, to dwell on the fundamental importance of irrigation in Indian agriculture. Agricultural development, as referred to the Royal Commission, is concerned with the improvement of the mechanical means for lifting and utilizing the water and with the effect of water on soil and crops rather than with the provision of new sources of irrigation. Many, if not most, of the indigenous mechanical means at present employed are very inefficient as regards the proportion of useful work secured to the amount of power consumed; while the water supply in innumerable irrigation wells is far from being either adequate or assured. Chapter IV of the report, to which reference has already been made, shows that the problem is receiving close practical attention from the agricultural departments. It is, of course, intimately connected with the further problem of the supply of capital to the small proprietor or cultivator. The large landlord, owner of an extensive estate, cultivated by tenants, who is much more in evidence in the United and the Central Provinces than he is in the Punjab, has both interests and duties in this connection, a fact which he is perhaps slowly beginning to recognise, though not many years ago the average Indian landlord was a mere rent receiver, a glaring contrast to English conditions, under which agricultural rent is seldom much, if anything, more than moderate interest on agricultural capital invested. Well irrigation must necessarily continue to occupy a position of very great importance in the agriculture of many parts of India, so that all possible improvements in securing supplies of subsoil water, where available, and in the effectiveness of the methods employed for raising it are highly desirable. At the same time there is, I am disposed to believe, a very large field for investigation into, and improvement in, the economical use of water for irrigation. It is not only necessary to provide a water supply, whether from canals or from wells, but also to secure that its use shall yield the maximum product. Success in this direction demands a full measure of scientific knowledge of the effects of the application of water to soil, both as regards the crops grown as well as the physical relations between soil and the water present in it. Comparatively little of practical importance has, I understand, been yet accomplished in this direction in India. In some canal irrigated tracts there is probably a tendency to waste water; to rely on irrigation to the neglect of superior tillage which would yield equal or better results with less water; while in tracts where no irrigation is available, either from well or canal, and all depends on a more or less precarious rainfall, every practicable scientific means for retaining soil moisture must be of immense value.

In this connection, it should be borne in mind that some 80 per cent. of the total area sown with crops in India is unirrigated. Any methods scientifically calculated to render dry (rainfall) agriculture more secure by an economy of soil moisture would be invaluable.

12. It is, I hope, unnecessary for me to point out the enormous importance of veterinary science and veterinary development to the Indian cultivator. It is a matter which cannot be too strongly emphasised. Cattle mortality, much of it avoidable, is probably one of the most, if not the most, prolific of the causes of agricultural indebtedness in India. Veterinary science is generally regarded as a science distinct from agriculture; but so intricate is the connection for many practical purposes between the Indian cultivators' bovine cattle and his land, not to mention himself, that veterinary development must be regarded as a most important aspect of agricultural improvement. The general tendency of bovine evolution in India, under the play of physical economic and, it may be added, social or religious forces, has been the establishment of breeds which, at the cost of deteriorated physical qualities, especially as regards draught power and milking capacity, can manage to exist on a minimum of subsistence, though cattle diseases levy an incessant and heavy toll. The number of practically useless animals is probably enormous, quality being largely sacrificed to quantity. The assertion often made nowadays by leading Indians that cattle have decreased in numbers is probably due in as great a degree to degradation of quality as to diminution in quantity. The work of the Civil Veterinary Department in regard to the prevention and treatment of diseases and to breeding is, I consider, on generally sound lines. I am not in a position to offer detailed criticisms; but the vital need for sustained and increased effort and for the more liberal provision of funds in a development which is fundamental for Indian rural prosperity cannot be too strongly emphasised. The systematic improvement of Indian cattle, the gradual repair of the results of centuries of ignorance and neglect, is an enormous undertaking; one in which it will necessarily take several generations to make an appreciable advance. It is therefore all the more essential that efforts in this direction should be vigorous, widespread and planned on an effective scale.

13. The Royal Commission will doubtless acquaint itself fully with the history of the initiation in 1880 and the subsequent growth of the provincial Departments of Land Records which are charged with the duty of collecting and compiling agricultural statistics field by field and village by village. Probably in no country in the world is such material available in greater quantity, in fuller detail, and, in general, of great reliability, considering the conditions under which it is collected and compiled, than in most parts of India. I may quote the case of my own province, the Punjab. In 1921, the working staff of the provincial Land Records Department included 9,000 *patwaris* or village accountants and 660 *kanungos* or inspectors, in addition to officials of higher grade. It dealt with the statistics of, and the rights in or over, some 44 million fields, comprising 59 millions of acres, assessed to an average annual sum of Rs.400 lakhs of land-revenue, owned by about four million proprietors, and tilled by not less than five, perhaps six, million cultivators. The agricultural statistics, which are compiled harvest by harvest and year by year, throw indispensable light on the process and the variation of rural prosperity. The main lines on which the work is conducted are, I believe, sound; but new conditions must in time demand changes of detail, though in this connection it is important to retain statistical continuity so far as is possible. Very little has as yet been done in India in the application of the more recondite and scientific statistical methods to the elucidation of rural and agricultural problems. The manipulation of statistics is mainly confined to the extraction of simple averages and percentages. A good deal more than this would, I am disposed to think,

be possible for scientifically trained statisticians; in obtaining, for instance, correlations between different factors of rural prosperity and the like. The remark is, I think, applicable not only to agricultural statistics, but to the vast mass of statistics on very varied subjects which are annually collected in India.

14. I do not propose to add much to the large quantity of written material which will doubtless be placed before the Commission on the subject of agricultural education. The dominant note of such education must be practical and, necessarily, to a large extent, technical; while in order to be effective it should be imparted to intelligences already awakened by sound general education up to the primary, or, so far as may be possible, to a higher standard. Anything claiming to be a complete agricultural education can, it seems obvious, be given only in a technical institution specialising in that branch of instruction. At the same time the elementary facts of agriculture and of botany may, I think, very usefully form a part of the vehicle of any general education directed to arousing and training intelligence. But in India, where agriculture in some form or another is a direct daily concern of a vast majority of the rural population, it is I believe desirable to go further than this. It is of course out of the question to give a full technical agricultural training to all students in the schools, but it should not be impossible to give to practical training in agriculture, of a standard somewhat higher than elementary, a recognised place in the curriculum of the ordinary vernacular middle school. In this way a large number of students of the cultivating classes, though they would not become fully equipped professional farmers, would at all events have the chance of obtaining some useful light, other than that derived from traditional lore, on their future life's occupation, and the measure might further help to dispel that distaste for agricultural pursuits which education, even up to a moderate standard, is apt to engender in the son of the Indian cultivator. Experiments in the above direction, which have been undertaken in the Punjab, seem to hold out hopes of success. It would of course be necessary that school teachers of agriculture should themselves have received a full practical and technical training.

As regards higher education; the provision of a two-years leaving certificate course as an alternative to the four-year degree course is, I consider, highly desirable for the purpose of securing full technical instruction and training for many of those who will have a practical concern with agriculture but are not in a position to proceed to a degree.

The economic and business side of agriculture is one which should occupy a prominent place in every system of agricultural education. It is an aspect which has, as I have already suggested, been specially neglected by the Indian agriculturist. It is desirable that the elements of agricultural economics should be given a place even on the lower rungs of the educational ladder.

15. Capital being as indispensable in agriculture as in other industries, and the average peasant cultivator having but little surplus wealth of his own to employ as capital, debt, or in other words the utilisation of personal credit for the provision of capital by means of loans, is an inevitable adjunct of peasant agriculture in most parts of the world and not in India only. But under an unhealthy system of credit, where numerous illiterate and often thriftless borrowers are in the toils of literate and astute moneylenders it is a fruitful economic evil and ultimately a political danger. The Royal Commission will find an immense mass of literature, official and unofficial, on the subject of rural indebtedness in India, its history, its causes, and proposed remedies. I do not propose to add to it by any lengthy observations here.

So far at least as the Punjab and the United Provinces are concerned the growth of rural indebtedness has been a consequence of the recognition,

in the comparatively early years of British rule, of a freely transferable proprietary right in favour of the peasantry. That recognition combined with moderation in the fiscal demands of the State placed at the disposal of the peasantry a volume of credit which grew with the value of land and of its produce. No doubt these conditions by themselves need not necessarily have given rise to the large amount of debt which at present exists; but they were combined with the illiteracy, the unsophistication, and the resultant thriftlessness of the average cultivator, while the legal adjustment of relations between the peasant debtors and the moneylending creditor was left to the operation of laws of contract, and of procedure, which were in practice often harsh and unsuitable. Under such conditions as the above it is not surprising that large portions of the existing volume of debt are connected with objects other than the provision of necessary agricultural capital. A very suggestive and illuminating study of rural indebtedness in the Punjab will be found in a recently published work—"The Punjab Peasant in Prosperity and Debt" by Mr. M. L. Darling, I.C.S. It gives a clear picture of the indigenous machinery of rural credit and its working. The essential unsoundness of that system appears to embrace two main aspects: (1) lender and borrower are not on an equal footing in economic position, in education, and in trained intelligence, so that the borrower comparatively seldom knows what a loan is costing him; (2) the lender does not recognise nor appreciate the fact that his real interests as lender are bound up with and promoted not by the poverty but by the prosperity of the borrower. The single individual borrower often becomes the prey of hard and frequently unjust bargains, the nature and ultimate results of which he has neither the capacity nor the intelligence to foresee, or even to understand. He stands alone and the property in land and in other things which he possesses is frequently small, so that the risk sustained by the lender of not realising his loan is considerable; and, as a result, the rate of interest which he charges in order to compensate himself for running that risk is high, and sometimes very high. Here we have one of the most important of the reasons for the indebtedness of the small cultivator or landholder, which is common all the world over and not in India only. That he should employ his credit to borrow capital for directly or indirectly productive use is perfectly legitimate and indeed necessary. The essential point is that the system of credit under which he works should be sound and healthy. The single individual cultivator standing by himself has, generally speaking, comparatively small resources of his own to support him, unless indeed he has some form of permanent right in his land. In such a case he is sorely tempted to raise the capital which he needs by mortgaging his land as security for a loan; a thing indeed which, if extravagantly inclined, he often does for purposes other than that of agriculture. In countless cases in the past the result of such mortgages has been that the small landholder has been expropriated actually, or for all practical purposes, from his land. If, however, several such persons combine their credit and severally and jointly assume unlimited liability for a loan borrowed on that joint credit, their position is very different from and far stronger than that of the solitary borrower.

Such, of course, is the broad fundamental principle of the Agricultural Co-operative Credit Society. It is, in my view, the one to which we must look in increasing measure for providing the Indian cultivator with necessary capital. I would go further and say that rural co-operation combined with improved agricultural practice is proving itself to be the most effective means of raising the economic condition of the Indian peasantry. It is by means of co-operation and by that only that the healthy system of credit is to be established which is so indispensable for the due prosecution of Indian agriculture. It seems unnecessary to discuss it minutely further in the present connection.

Sir Patrick Fagan.

Government loans (known as *taccavi*) for agricultural purposes have been made in the past, under statutory authority, on a considerable scale. There can be no doubt that they have been of great use and have led to the construction of very many permanent improvements, more especially irrigation wells; but it is not possible by such means, even if extended to the utmost practicable limits, to provide that sound and healthy system of rural credit which is wanted.

16. Domestic industry supplementary to agriculture would, it might seem, very naturally take a textile form, though with looms more efficient than those commonly found in villages and using better yarn. But it is scarcely possible that if the products of such industries were restricted to the ordinary kinds of cloth, they could successfully compete with those of the power loom installed in the factory. It would be in the production of more artistic goods that the domestic weaver might succeed in supplying a future demand, both in India and in Europe, of which, I am disposed to think, there is a substantial possibility. This however assumes a considerable rise in the general standard of rural education and taste, and ultimately perhaps the institution of rural technical schools; together with a weakening of the idea, still to some extent prevalent, that weaving is a degrading occupation. It is in fact social prejudices and restrictions of this kind which offer the chief hindrances to the opening up of the supplementary sources of rural income under reference. They rule out, for instance, such a development as poultry farming, while pig-keeping, of course, cannot be mentioned in this connection. But economic pressure will no doubt begin to tell in time by modifying and in some degree overcoming existing obstructions.

17. The development in India of large scale industry of the factory type scarcely falls within the scope of this memorandum, though if and when it reaches the stage of substantial reality it must exert deep and far-reaching reactions on Indian agriculture. That stage however is yet far distant, lying beyond a long intermediate interval of social and economic evolution. It is scarcely possible to defer treatment of the problem of agricultural and rural prosperity until that rather problematical period at which the stage may be reached.

18. The co-operative principle has, I think, a great part to play in the promotion of rural prosperity in India, above and beyond its primary function of providing credit. In this connection, I cannot do better than refer to Chapter XIV of "The Wealth and Welfare of the Punjab" by Mr. H. Calvert, I.C.S., where the whole subject receives most suggestive and enlightening treatment. By means of co-operative machinery, much can be done for the improvement, to the financial benefit of the cultivator, of the handling and marketing of agricultural products; the purchase of agricultural seed, implements, and stock and of the commodities of general domestic consumption. Actual working examples are to be found in the Punjab and doubtless in other provinces also. In the first the consolidation of fragmented holdings has in many cases been carried out by means of co-operative bodies. Last, but not least, the value of the moral education which co-operation affords in self help, thrift, self-respect, and social solidarity can scarcely be over-estimated, while it will probably be no less effective than recently created political institutions in engendering an intelligent public opinion on the general affairs of the community.

19. I am not in a position to give detailed and up-to-date information in reply to the special questions on "Marketing," of which I have been favoured with a copy; but a few general observations may be of use. During the period of my experience the system under which agricultural produce was marketed varied with the economic position and with the intelligence and enterprise of the cultivator. Grain produce, oil seeds, and

cotton were commonly delivered to the local village trader who was also the village banker and moneylender. When, as was often the case, the cultivator was an indebted client the value of the produce was placed to his credit, generally in reduction of an existing debit, at a price considerably below the current market price. In such cases actual cash comparatively seldom reached the pocket of the cultivator. The moneylender himself was often in business relations, as agent, principal or partner, with a trader in some adjacent market, who in his turn would dispatch produce collected from the villages to some larger commercial centre for Indian consumption, or to the sea port, Bombay or Karachi, for export to Europe. The above description, so far as the cultivator is concerned, applies more directly to the economically weaker and less enterprising agricultural groups, such as the riverain Muhammadan tribes. More satisfactory, or perhaps less unsatisfactory, conditions existed among many of the more sturdy, enterprising and prosperous Hindu and Sikh Jats of the uplands. These often possessed substantial carts of considerable capacity, in which they carried their harvested produce, frequently for long distances, to market towns or trade centres (*mandis*) where prices were known to be more favourable than nearer home. Sale in such cases was made for hard cash at prices at or near prevailing wholesale market rates. This kind of transaction has become increasingly prevalent in the canal irrigated tracts of the Punjab, and especially in the Colony areas. The purchasing intermediary dealer in such cases was sometimes a merchant trading on his own account, sometimes a commission agent purchasing on behalf of firms located elsewhere in larger trade centres or at the sea ports, and sometimes a dealer carrying on business in both capacities. In the canal colonies of the Punjab it is now common for the large European exporting firms of Bombay and Karachi to establish their own local branches for purchase of agricultural produce. They deal with the cultivator who carts his grain to market not directly, but through the local small broker (*dalal* or *kacha artia*); the latter arranging the bargain. I have come across cases in which the large European firms merely finance direct export, *via* Karachi or Bombay by the local up-country dealers, taking as their remuneration interest on the sums advanced *plus* a commission on the amount realised by the sale of the exported commodity in the English market.

On the whole, it is I think fairly clear that the Indian cultivator has in recent years been brought into closer touch with the market for agricultural produce, both Indian and European, and that increased trade machinery has placed him in a better position in regard to prices obtainable for such produce. Indeed it is now not uncommon for the more prosperous class of cultivator in the Punjab to withhold grain, cotton, or oil seeds from the market in expectation of a rise in price. I have come across cases in which loans have been taken from rural co-operative banks for payment of land revenue and for other expenses pending the ultimate sale of produce thus temporarily withheld.

At the same time there is, I think, some danger of an undue multiplication of middle-men, especially in times of brisk or improving trade. The tendency is perhaps encouraged by the fact that the business proclivities of the Indian at present lie in the direction of trade and commerce rather than in that of industrial production. So far as my experience goes the margins upon which intermediaries in the agricultural produce trade operate are on the whole generally moderate. The danger lies more in an excessive number of intermediaries than in excessive rates of profit. An effective remedy may I think be found in the wide development of co-operative marketing through the agency of the rural co-operative society. There seems to be no reason why such societies should not deal direct with traders in local or extra-local markets or ultimately even with the large exporting firms at the ports.

Sir Patrick Fagan.

The erection of markets (known in the Punjab as *mandis*) in agricultural centres of an urban or semi-urban character for the disposal of agricultural produce is, I think, a desirable development. A good many of these have been opened from time to time in various districts in the Punjab, for instance at Moga in the Ferozepore district, and more especially in the Canal Colony areas. Not a few of them have prospered greatly. They consist of a large square or squares with a more or less pretentious gateway and surrounded by shops and warehouses which are let on rent to traders. The market is generally initiated and in its early stages administered by the district board or other local body. These institutions serve to place the cultivator in close touch with actual market conditions.

20. In the past the impurity of the grain which reached the markets has been a distinct handicap to Indian agriculture, principally in connection with overseas export; and the same remark applies in some degree to cotton. Under the system of standardisation prevalent in the past it was not unknown for the cultivator to deliberately mix dirt with his grain before bringing it to market in order to obtain the full value of the permitted degree of deficiency. But I am not aware that such a practice is still common: so far as it may be the remedy would appear to lie in the adoption of more rigorous standards. The chief means of improvement, however, obviously is the use of seed of pure breed and of uniform quality. This can be secured in the main only by the scientific work of the agricultural departments and by the wide adoption of the results obtained. In the latter stage very important assistance can be rendered by co-operative societies and by large landlords. The employment of grain-elevators at railway stations will no doubt be beneficial, provided however that the use of good uniform seed first comes into wide vogue.

There is I think much useful scope for the adoption of the steps specified in question (*d*) relative to marketing. The markets which I have suggested could be used as appropriate places for publication, while co-operative societies could play a very useful part.

I apologise for the length of this note. The profound importance of the subject is my excuse.

Replies to the Questionnaire.

In dealing with some out of the large number of issues raised in the questionnaire, I am necessarily hampered by a want of up-to-date local knowledge, due to the fact that more than five years have elapsed since I left India. I would ask that this limitation may be borne in mind in any consideration which may be given to my replies.

In connection with my replies, reference is also invited to the preceding general memorandum which I submitted to the Royal Commission last year.

QUESTION 1.—RESEARCH.—(*a*) (i) " All research affecting the welfare of the agriculturist " connotes a very wide area of investigation, embracing not only the more purely technical, but also the economic aspects of Indian agriculture. But it is without doubt the necessary basis for sound rural progress. Until a fairly comprehensive view of agricultural conditions in both the above aspects has been obtained it will be difficult to isolate and define the problems to be solved, and to begin the pursuit of appropriate solutions.

The technical aspect falls, of course, quite properly within the scope of an Agricultural Department in the strict sense of the term. I doubt, however, whether it can, unaided, deal adequately with the economic side, involving problems such as costing based on a wide range of statistics; the movement of prices and of population; rural income and expenditure and many others. One is loath to suggest an increase of departments, but I am disposed to think that some organisation, of the nature of a department, charged

definitely with the conduct of economic enquiry as bearing on rural progress and working in close co-ordination with a technical agricultural department, is likely to be necessary. Possibly an expansion of the provincial Land Records Departments might supply the necessary machinery, while a semi-official body such as the Punjab Economic Board, which had begun rural and urban economic inquiry shortly before I left India, would be useful.

Research into the scientific value of the indigenous theory and the traditional methods of Indian agriculture should form an essential part of the technical work of an Agricultural Department. Healthy progress in India, as elsewhere, must largely be a transformation of the old into the new. To assume *a priori* that all that is indigenous is bad would be to repeat the disastrous error into which our Victorian predecessors fell in dealing with Indian education. Enough, however, is already known of indigenous Indian agriculture to ensure that this cannot occur.

QUESTION 2.—AGRICULTURAL EDUCATION.—On this question generally, I do not think that it is either possible or desirable to give agricultural instruction of a fully vocational type in schools for general education. At the same time the elementary facts of agriculture, botany, and agricultural processes afford valuable materials for the cultivation of intelligence and of the observational powers, which are important views of general education. Such subjects should, I think, find a prominent place in the curriculum of rural education. Some degree of what may be termed pre-vocational instruction in agriculture would then be afforded in rural schools, primary and middle.

(iii) Yes, certainly, so far as properly qualified men are available.

(v) The main incentive, in my time, appeared to be a desire to secure official posts in the Agricultural Department.

(viii) For my general view see above; and also paragraph 14 of my General Memorandum. (*a*), (*b*) and (*c*) should be useful, primarily as means, *inter alia*, for cultivating youthful intelligence and observational power, &c., secondarily as tending to throw useful light, other than that derived from traditional lore, on the rural boy's future lifework; thirdly, by affording a modicum of practical training.

(x) If this refers to the town-bred youth, I doubt whether it is necessary to attract him to the fields, or even desirable to do so.

(xii) The efficacy of technical agricultural education for the adult depends, of course, very largely on the standard of his previous general education. In most cases at present this will be low. Such adult education must, I think, be personal and individual rather than scholastic, directed mainly to questions of daily practice, and assuming the form of friendly discussion rather than pedagogic instruction. The lantern and slides should be useful adjuncts.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) The Punjab cultivator has no taste for a novelty as such. If, however, it can be shown by ocular demonstration to be capable of yielding an early and substantial net increase of profit, and if, in the case of an implement, it is simple in working and easily repaired, he will regard it with favour and probably in due time adopt it. He has a keen eye for possible defects and drawbacks.

My impression is that improvements in implements and materials, especially seed, have up to date been more frequent than improvements in agricultural processes.

Demonstration on a plot of the cultivator's own land is probably as good a means as any of convincing him of the value of improved seeds, implements and processes.

Visits, preferably of parties of cultivators, to experimental farms of the Agricultural Department are useful as being suggestive and as awakening interest; but they need to be supplemented and their results driven home by demonstration on the cultivator's own land.

Sir Patrick Fagan.

QUESTION 5.—FINANCE.—(*a*) See paragraph 15 of my General Memorandum. This is, of course, a very large question with which it is not possible to deal fully in the short time at my disposal. Capital obtained on credit is as necessary for agriculture as for any other branch of industrial production. I understand that the question relates to capital needed strictly for agricultural operations, not to funds needed for domestic objects more or less indirectly connected with agriculture. The main desideratum is that the system of credit shall be a healthy one, that is, one in which (1), borrower and lender deal with one another on a more or less equal, or equitable, economic footing, and (2), each contemplates that the other will profit by the transaction and the lender does not seek to depress and exploit the borrower. The indigenous system of agricultural finance on credit afforded by the village moneylender satisfies neither of the above conditions.

My view is that as regards short-term credit, that is for the provision of rapidly circulating capital or of recurring capital expenditure, cultivators must have recourse to the co-operative credit societies. The spread and development of these institutions should be fostered by every available means. Advances by Government under the Agricultural Loans Act of 1884 are very useful, especially in seasons of adversity or on occasions of widespread disaster, but even if extended to the utmost practicable limits they cannot perform the functions of a normal system of short-term rural finance.

For long-term credit efforts should, I think, be directed to the formation and development of co-operative mortgage banks. Tentative steps have, I understand, been already taken in this direction in the Punjab and a few such banks already exist; but the matter seems to be as yet in the experimental stage.

The scope of long-term loans which can be made to landholders under the Land Improvement Loans Act of 1883 is far more limited, of course, than that of the loans which a Land Mortgage Bank would provide. The latter would include loans for redemption of prior mortgages, for liquidation of debt, for purchase of land, &c., in addition to loans for permanent improvements. Here again, therefore, it is not to be expected that Government loans, even if far more numerous than they are at present, can fully supply the requirements of long-term rural credit. They are at present the best means available for meeting those requirements pending the development of Land Mortgage Banks.

(*b*) In the absence of co-operation, *taccavi* loans have, I think, been of great agricultural use, though it is rather the fashion to decry them. Impediments to their greater popularity are to be found in the friction which is inseparable from the movement of official machinery, and which is not confined to India, and the comparative rigour of punctuality in payment on which it is necessary to insist in the case of public money, but which in the eyes of the cultivator contrasts unfavourably with the astute laxity of the moneylender. As regards the first impediment, it has been found that peripatetic distribution of loans under the Act of 1884 in the villages, instead of their issue at tahsil headquarters secures greater popularity. It is desirable that a similar system should be introduced, if this has not already been done, in the case of improvement loans under the Act of 1883.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) In the matter of finance the average Punjab cultivator is in a position not dissimilar to that of the ordinary peasant all the world over in the absence of any system of co-operative credit. He is generally illiterate, knows nothing of accounts and keeps none, and has generally the vaguest notion of his own financial position. On the whole his outlook, intellectual, moral, cultural is bounded by the needs of to-day and of a comparatively short span of the future,

while his annual income, even in canal-irrigated tracts, dependent as it is on the chances and vagaries of the season, fluctuates in amount between more or less wide limits; wider generally than they seem to be to the inexpert onlooker. The deficiencies of a bad year are felt to the full while the excess of a good one is apt to be seriously diminished, or perhaps even to vanish, in a series of more or less unconsidered items of extra expenditure. His account with his moneylender, who often is also the local shopkeeper and general provider, is thus normally in debit, an overdraft being the account form which rural indebtedness usually takes, supported sooner or later by bonds and land mortgages. The chief occasions for rural borrowing, that is, for additional debits to a perennial overdraft in the moneylenders' book, are somewhat as follows:—Purchase of cattle; household expenses, frequently for marriages and other social or religious ceremonies; payment of land revenue; purchase of seed; litigation.

The above is an inadequate account of the causes of borrowing. The causes have to be carefully distinguished from the volume or extent of rural borrowing. The latter depends mainly on the value of land and its outturn. These have advanced very notably within the last twenty, and still more, of course, within the last fifty years. The consequence has been an enormous increase in the volume of rural debt. Enquiry shows clearly that the volume of debt grows with the expansion of credit at the cultivators' disposal, which follows on an increase in the value of his land and its products. This result is an aspect of the comparative thriftlessness of the Punjab cultivator, itself the consequence of his limited mental outlook and of his physical and economic environment.

(ii) The main sources of credit from which the cultivator finances himself are in the Punjab (1) the moneylender; (2) the comparatively wealthy landowner or occupancy tenant who has surplus money to invest, a class which has grown during the last twenty-five years since the introduction of the Punjab Alienation Act of 1900; (3) Government under the two *taccavi* Acts; (4) certain minor sources, such as the itinerant cattle vendor, who sells on credit; goldsmiths who act as pawnbrokers for domestic jewellery; (5) the co-operative credit society.

(iii) The reasons which directly hinder the liquidation of debt are briefly—

(1) the uncertainty and in some tracts the precariousness of agricultural results;

(2) the manipulation of accounts by the moneylender in his own favour and to the detriment of his debtor. This takes various forms; short credit of payments to account by undervaluation of produce delivered; a preliminary discount at the time of the loan, and possibly others;

(3) as a psychological factor, acquiescence in indebtedness as a normal element in agricultural life.

(*b*) I know of no royal road which will lead to a speedy lightening of the burden of agricultural debt. It can only come gradually as the result of the progressive growth of intelligence and a widening of moral and mental outlook consequent on sound and widespread rural education, mainly of the primary type, combined with increased development of co-operative credit on the one hand and an improved and more scientific agriculture on the other. Agricultural indebtedness arising from legitimate capital expenditure can never disappear. It is probably not desirable that it should. What may be hoped for and striven for is the curtailment of the great amount of unproductive debt which at present exists, and which largely consists of compound interest on debts incurred for not directly productive expenditure.

I do not feel confident that very much can be effected in the actual reduction of rural debt by special measures of the kind suggested in the

questions. They appear to be directed rather towards alleviating the results of debts already incurred, rather than to preventing the creation of new debt. A rural insolvency measure does not impress one favourably.

As regards the Usurious Loans Act, a legal provision requiring a moneylender to render to his debtor at prescribed intervals a properly stated account in prescribed form and in the ordinary Punjabi script, not in the illegible Lundi or Tankri usually adopted by the rural moneylender, would, I think, be useful. I rather think that a recent provincial enactment does contain some such provision.

The Punjab Redemption of Mortgages Act was, I consider, a useful measure, but to the best of my recollection extensive use had not been made of it up to the time I left India.

(c) Such measures have been in force in the Punjab under the Alienation of Land Act since the year 1901. It should be clearly recognised that the primary object of that Act was to prevent the permanent transfer by members of the agricultural tribes to non-agricultural moneylenders and others of their proprietary and tenant rights in land. The creation of such rights and their subsequent great appreciation in value were the direct results of British administration, and they placed at the disposal of the landholder a progressively expanding volume of credit. The Act aimed directly, not at the reduction of existing indebtedness, but at checking one main result of an unhealthy indigenous system of agricultural finance. It was not the object of the Act to prevent all transfers, but those only which were regarded as economically and politically dangerous in threatening to convert a virile mass of peasant landholders into a landless proletariat tenantry. Under the Act transfer as between members of agricultural tribes are, subject to a few exceptions, unrestricted.

In so far as the moneylenders' field of operation has been limited—it has in no sense been entirely closed—the facilities for borrowing open to the cultivator have been restricted; but the place of the moneylender has, in a considerable degree, been taken by the well-to-do agricultural tribesman, who can now invest his surplus, without the keen competition of the moneylenders in loans to his fellow-tribesmen. The net result on the sum of agricultural debt is difficult to gauge. It has certainly not been reduced, but is probably now less than it would have been had the Act not been in operation and the moneylender been free to proceed with the exploitation of a thriftless and illiterate peasantry.

If rural proprietary right had at the time of its original creation, or recognition, by the British Government been subject to definite and strict control in respect of alienation, without distinction of the class of the alienee, agricultural debt would doubtless be far less than it is at present; though other economic results, perhaps less desirable, might have supervened. Conjecture is on the whole profitless, but it is, I think, true to say that if it is sought to hinder or prevent the growth of agricultural debt by restriction of the right of sale and mortgage, such restriction should be far wider than is provided by the Punjab Alienation of Lands Act. On the other hand, to go to such a length would practically amount to depriving the cultivator of the power of raising funds for legitimate and reproductive capital expenditure on his daily industry.

The real and effective remedy for agricultural indebtedness seems, in my view, to be a reform of the indigenous system of credit, coupled with sound primary education of the agricultural masses, and supplemented by such legal restrictions on sale and mortgage as are necessary for counteracting the wider evil results, economic and political, which flow from unrestricted resort to an indigenous system of unorganised credit. The provisions of the Punjab Alienation of Land Act seem to me to be generally suitable for the latter purpose.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) See paragraph 10 of my general Memorandum. Briefly, consolidation of cultivators' holdings each scattered over several, and often many widely separated plots is, I consider, an agricultural reform of the first importance. Clearly it is a process which it is desirable to carry out, so far as possible, by the mutual agreement of the parties concerned rather than by legal compulsion. Before I left India work on these lines had been begun in certain districts of the Punjab by rural co-operative societies, and has since, I understand, been prosecuted with much success. Co-operative Agency, under appropriate official supervision, is probably the best that can be employed, but it seems to be the case that for a considerable time to come it will not be available in sufficient quantity to allow of a speedy solution of the problem.

(*b*) See last question. An obstacle appears to be the want of sufficient agency. Co-operative societies, it is probable, for some considerable time to come will be able to deal with only a small portion of the ground to be covered.

Analogous work, however, has been carried out in the past by official agency in the newly canal-irrigated tracts of the Punjab. I refer to the process termed "*killabandi*" under which, as a condition precedent to the provision of irrigation from a new canal to any village, it was required that all the cultivated fields of that village should be rearranged and consolidated in rectangular plots of suitable area. The main objects in view were to facilitate the distribution of canal water and a proper assessment of water-rates. The process often involved extensive interchange of land between the owners; and a definite procedure for carrying it out was officially prescribed. It was based on mutual consent and there was, if I recollect correctly, no legal compulsion; though the prospect of canal irrigation of course acted as a strong incentive to the landholders concerned to accept the *killabandi*.

Consolidation in a heavily comminuted village in the Central Punjab would probably differ in important respects from *killabandi*, e.g., dislocation would probably be far more extensive in the former; but still an appropriate modification of the *killabandi* procedure could probably be framed, which would be found suitable for consolidation of fragmented holdings.

(*c*) Legislation will, I anticipate, be necessary with reference to the matters specified; but I should be inclined to postpone it until further experience has been gained in work to be carried out by co-operative and official agency; the latter on lines such as those suggested in the last question. What has up to date been accomplished by the former seems to indicate that there is a considerable field which can be dealt with without legislation, mainly I imagine in the comparatively congested districts of the Central Punjab. The Act should provide for the exercise of compulsion on a dissentient minority. The intervention of the Civil Courts in the work of consolidation should be excluded, but in cases where title to land is in dispute it will be necessary, probably, to defer completion of consolidation until the dispute has been settled in such courts, thus following existing practice in the partition of agricultural land.

QUESTION 8.—IRRIGATION.—(*a*) Please see paragraph 11 of my general Memorandum.

I understand that a scheme is under consideration for the extension of canal irrigation to the Sirsa tahsil of the Hissar district by means of a new Lower Sirhind Canal with head works on the River Sutlej, near Phillaur, and to the Bhiwani tahsil of the same district from the existing Western Jumna Canal. I knew those tracts fairly well in the early years of my service. Up to the present agriculture in them has been entirely dependent on a precarious rainfall so that assured perennial canal irrigation should be of enormous benefit to them.

(*b*) The equitable and timely distribution of canal water to the cultivator is probably the main ever pressing problem of canal administration. The moral character of the subordinate staff of the irrigation department is the factor of fundamental importance. However good the technique of distribution and the type of outlet adopted, corruption of subordinates will wreck the most perfect scheme. Canal water—if oriental hyperbole may be allowed—is often liquid silver, if not gold; so that when matters reach the stage of corruption the cultivator is often not backward in playing his part. Vociferous complaints of mal-distribution are not infrequently covert regrets at non-success in the game of corruption. I have no wish to stress this matter unduly, but it is one which cannot be neglected.

I understand that it was recently decided to fit all village outlets with mechanical modules which ensure a uniform supply of defined volume. This is a desideratum which has been sought for years. Given a comparative freedom from certain hindrances, to which I have already referred, the reform should secure great improvement in distribution; especially in the tail reaches of canal and distributary, where complaints are generally loudest, and often not without reason.

Many irrigation engineers are, I believe, of opinion that commonly too much water is applied by cultivators, and that with better cultivation equally good or better crop results could be secured with less water. I am disposed to think that the view is not devoid of foundation; but the whole subject is eminently deserving of full scientific investigation by experts of the Agricultural and Irrigation Departments jointly, as an aspect of the general problem of the physical and chemical relations of moisture to soil and to the crops grown thereon under Indian conditions. A beginning had been made at the Lyallpur Research Station before I left India, but I do not know what, if any, results have been reached since then.

I doubt whether the prevailing system of acreage assessment of canal rates, having regard to their comparatively low pitch, tends of itself to a restriction of the area to which available water is applied. It is, however, fairly clear, I think, that a system of volumetric supply and assessment by meter, in place of the acreage system, if it is possible to devise a satisfactory one, would encourage a more economical use of canal water. The matter was under discussion and trial when I left India. There are, I believe, many difficulties in the way. A serious one is the extensive co-operation between irrigators which a volumetric system would apparently entail; co-operation not only among irrigators of the same village, but between those of adjacent villages.

QUESTION 9.—SOILS.—(*a*) The measures which suggest themselves, and which are in fact already provided for, are:—(1) Government loans under the Land Improvement Loans Act; and (2) Postponement of all land revenue assessment on the reclaimed land until the capital cost with interest has been realised from the profits yielded by the reclamation. (3) Expert advice gratis from the officers of the Agricultural Department.

QUESTION 10.—FERTILISERS.—(*a*), (*c*), (*e*) and (*f*). It is, I understand, the view of experts that the Punjab soils in spite of fairly constant cropping recover fertility by natural means, nitrification, and so forth, more rapidly than soils in this country, and that the net additional money yield resulting from the use of artificial manures or fertilisers is less. I doubt whether there is much early prospect of the widespread use of the latter. It does not seem likely, certainly not until artificial nitrogenous, phosphatic or potash manures can be manufactured in India and put on the market at cheap rates. Further investigation into the physical and economic results of the employment of such manures is probably required.

In the meantime a primary requisite, I think, is a better and more effective use of farmyard manure, which is mainly cattle dung, and of

night soil. The main desideratum is better methods of preserving the former with a view to diminishing the large loss of manurial constituents which takes place. India's loss of potential wealth under this head is probably enormous.

It is, I fear, hopeless to expect that the use of cowdung as fuel can be displaced, at all events in the plains. The extension of irrigated reserves for fuel which such a displacement would require is, I think, impracticable. Cowdung will remain the staple fuel for a long time to come. This seems to render improved storage of such manure as is available, and its more scientific application, the more necessary. Demonstration work in this direction, after needful investigation, by the Agricultural Department is most desirable.

From the point of view of manure the urine of cattle is at present very largely, if not entirely, wasted, as a result, no doubt, of the very small extent to which litter is provided for cattle. This again seems to be a matter in which investigation and demonstration is desirable. The more profitable use of human excreta as manure in rural tracts is bound up with the large and difficult question of village sanitation. Much of it, of course, does at present act as manure, though in an unsystematic and insanitary manner, in the immediate vicinity of the village site.

In view of the small amount of plant food which is returned to the soil in comparison with that annually removed, what may perhaps be termed the "stercoral" problem is in reality of the first importance in the agriculture of rural India.

The folding of sheep on cultivated land is practised in the Kangra hills, where the flocks of the itinerant Gaddi shepherds are utilised by cultivators for this purpose on payment of a small fee to the owners. Cattle folding does not prevail, so far as I am aware, in the plains, where local conditions are not favourable; but possibilities should I think be explored.

Green manuring is probably too expensive an operation for the average cultivator.

QUESTION 15.—VETERINARY.—(*a*) In view of the fact that the major portion of the activities of the Civil Veterinary Department are directly connected with or subservient to agriculture, I am of opinion that, as at present, general control of the Department should be with the Director of Agriculture; that is to say, so far as questions of policy are concerned, the details of departmental administration being left in the hands of the Chief Superintendent. There is probably no need for the Director to intervene in the matter of horse, mule and donkey breeding or of veterinary instruction. Please see paragraph 12 of my Memorandum.

(*d*) It is, I believe, maintained by veterinary officers that really effective protection against cattle disease is impracticable in the absence of legal powers to prevent the movement of diseased or infected animals. There is beyond doubt much to support the contention. The matter, however, is just one of those, a numerous class, of which the treatment is rendered very difficult by the absence in India of enlightened public opinion and breadth of social vision and outlook. The same applies to compulsory protective inoculation. So serious however is the drain which cattle disease entails on rural resources and so serious is the handicap which it imposes on agriculture that the time has I think come, not perhaps for the general application of legislation at once, but for the exploration of legislative possibilities. I am disposed to suggest a tentative legal measure, to be applied by the Provincial Government, after consultation with local bodies, to a few selected areas specially subject to cattle disease. The scope of the enactment might, I think, be with advantage confined in the first place to the subjects of prohibition of the movement of diseased or infected animals and compulsory inoculation. Legal power to deal with the second matter has I understand been recently taken in the Madras Presidency.

Sir Patrick Fagan.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) There are questions for technical experts, on which I do not feel competent to express opinions. As regards dairying I invite reference to paragraph 9 of my memorandum. It is of course needless to insist upon the necessity for the distribution of approved, properly bred bulls of selected indigenous breeds, and for the castration of young male stock in the villages.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*b*) Please see paragraph 16 of my Memorandum.

The selection of rural industries subsidiary to agriculture seems to be limited by two main factors:—

(1) Such an industry must generally be of the domestic type.

(2) It must be such that its product is not liable to successful competition from that of large-scale factory industry. This rules out the commoner classes of textiles. Textiles of more artistic type are made in villages in various parts of India—I remember some in the Bikanir State 35 years ago. It is perhaps worth considering whether the extension and development of such industry is not practicable. There is a considerable demand for Oriental art products in Western countries.

(*c*) The main obstacles are, I think:

(1) Rural inertia.

(2) Prejudices, based on class or caste.

The latter apply to such an industry as poultry keeping, and probably to rope and basket making also.

There is a considerable field in the Punjab for fruit and vegetable culture which deserves early exploration by economic botanists, of whom there is, I understand, only one in the province at present.

The scientific date-palm culture in the Muzaffargarh district affords a striking example of what can be done. The submontane tracts of the province are well suited to the mango, which grows there in abundance; but the fruit is capable of great improvement in quality. The development of mango cultivation would well repay investigation. Lac is a common product in the same tracts. There was a considerable export from the Hoshiarpur district when I was serving there twenty-five years ago. The industry is probably capable of development.

In the submontane districts there also seems to be a promising field for sericulture, which is apparently making some way among the poorer cultivators and village artisans.

(*d*) It seems probable that most of the industries specified, if established on a domestic-village basis, would have, sooner or later, to compete with large-scale factory production without much prospect of success. I do not think that Government can usefully take any large direct part in the establishment of such industries. It must depend mainly on the enterprise of individuals.

(*e*) The limited extent to which such a process is possible, or scope for it in existence, would, I think, go a very little way to help solving the problem of rural subsidiary industries.

QUESTION 19.—FORESTS. (a) My local knowledge is far from being up to date, but so far as my personal experience goes I should answer both the questions in the affirmative. It should be borne in mind that the extent of popular demand for grazing and other privileges in Government forest areas (reserved) are often, if not generally, incompatible with the minimum of conservancy needed for their reproduction and preservation.

In my time the Kangra district was a case in point as regards protected forests, though the legal conditions there are rather special.

At times of fodder scarcity reserve forests have been opened to grazing with a special degree of freedom.

(*b*) The problem of firewood supply chiefly affects the plains, and it is, I fear, an insoluble one. Fuel reserves in the plains must be under canal irrigation and in convenient proximity to the villages to be served. At the same time, in order to ensure reproduction they must be under more or less scientific conservancy. They could not be maintained, at any rate for a long time to come, except by official and professional agency. The cost of such a system would probably be prohibitive, and it could not be extended to unirrigated tracts. Firewood supply in hill tracts in the proximity of forests is probably not insufficient.

Expansion and improvement of the rural fodder supply (grass and crops) is, I am disposed to think, largely dependent on the development of a rural dairy industry. I have made some rather vague suggestions in this connection in paragraph 9 of my memorandum. Apart from some such development it would scarcely pay the cultivator to establish irrigated pasture on meadow land; and permanent meadow land in the Punjab plains is an impossibility without irrigation.

The "*Bir*," or private grass reserves, dependent on rainfall, is not unknown in tracts where uncultivated land is extensive, but the number of these is decreasing with the spread of cultivation and irrigation. I question whether it would be possible to secure the extension of such reserves.

For the present the expansion of the fodder supply seems to be dependent on the more extensive cultivation of fodder crops, especially in irrigated areas. Of such crops the most promising seem to be the clovers, which, in addition to providing good food for cattle, have a beneficial manurial and restorative effect on the soil.

(*c*) The principal case which came within my experience was the vast damage which had been done by the deforestation of the Sewalik Hills to areas in the Hoshiarpur district, which were originally among the most fertile in the Punjab. Up to 1904 the damage had proceeded unchecked, and likewise the official correspondence about it. The literature on the subject is very voluminous: selections from it may have been placed before the Royal Commission. It should be observed that the destroyed forests were not Government reserves but private property; and that the destruction was due to the villagers own unregulated action in indiscriminately cutting down trees for sale and other purposes and in allowing excessive grazing of sheep and of goats; the latter, of course, being a specially destructive agent of arboreal growth. The Hoshiarpur-Sewalik case is, I believe, the chief instance of such damage and erosion resulting from deforestation to be found in the Punjab.

So far as the erosion and damage is caused, as it generally is, by floods issuing from deforested hills little can be done effectively in the way of remedy until the evil has been materially checked at its source in the hills; that is to say, until conditions there have been rendered suitable for gradual re-afforestation by reproduction, natural and artificial.

The first and essential step is the exclusion of browsing animals, sheep and goats, more especially the latter, from the denuded area, and strict regulation and restriction of grazing by horned cattle. It will probably be advisable in most cases to close for permanent reservation the higher portions of the denuded area entirely, subject to regulated cutting of hay after grass has ripened. The lower portions can, with advantage, be closed in rotation for limited periods. My experience in Hoshiarpur, 25 years ago, indicated that initial operations of this kind could secure a rapid recrudescence of brushwood, shrubs and grass; while mere exclusion of sheep and goats without further strict reservation was decidedly beneficial. Initial operations of the above kind must be followed up in due time by tree planting under scientific supervision. The operations, unless very tactfully conducted, are, of course, likely to be distasteful and irksome to the

villagers concerned. A special legislative enactment was framed to deal with Hoshiarpur and similar cases. A scheme under which Government takes the denuded land on a long lease from the villagers and thus obtains a free hand for re-afforestation has, I believe, been tried with some success in the United Provinces, but I have no personal knowledge nor experience of it.

(*d*) As regards canal supplies the main desideratum is the due preservation of forest vegetation in the hilly areas which form the watersheds of the rivers from which the canals take off. This operates to regulate and equalise the run off from the catchment areas and also to encourage precipitation of moisture in the form of rain.

I do not think that much can be done in the plains by means of afforestation to increase soil-moisture or rainfall. As regards the former, a forest possibly acts to some extent as a wind-break to cultivated land in its vicinity; but the action of forests on the plains in increasing precipitation of rain is, I understand, very doubtful. At all events, afforestation in the plains to an extent likely to be effective in either of the above directions is, I should think, quite impracticable for various reasons.

(*e*) See (*b*) above. I doubt whether there is such an opening. The main object would be, presumably, fuel supply. I do not think that this could be secured in an effective form.

(*f*) See (*a*) and (*e*) above. I should say that there is generally no such deterioration in Government reserved forests. It is probably taking place in certain protected forests. The latter was certainly the case in the Kangra district in my time. In private village forests such deterioration was certainly in progress and no doubt is so still. The browsing goat is the chief agent of destruction. Apart from legislative compulsion, the application of which on so extended a scale is impossible, the remedy must, it seems probable, be ultimately sought in co-operation of an appropriate type.

QUESTION 20.—MARKETING.—(*a*) to (*d*) My observations on the matters dealt with in this question will be found in paragraph 19 of my Memorandum.

QUESTION 22.—CO-OPERATION.—(*a*) My views on co-operation in general will be found in paragraph 15 of my Memorandum. I do not know that I can usefully add much here; but I should like to state definitely that, so far by my own experience here extended, an immense alleviation of rural indebtedness is being gradually effected; while the moral education in self-help, thrift, self-respect, and social solidarity which is being silently imparted can scarcely be over-estimated.

It is desirable that the general attitude of Government towards the co-operative movement should be helpful, encouraging and educative rather than dominating, one of leadership rather than of pervasive official control. while anything of the nature of an attempt to force the pace, much more of compulsion, is, of course, to be entirely deprecated. Current policy, I believe, satisfies these conditions. The ultimate ideal no doubt is to free the movement entirely from official leading strings, but how far this will be practicable remains to be seen in the distant future.

(*b*) The question is one for experts with better up-to-date local knowledge than I possess. Most of the types of society specified deal with important activities of rural and agricultural life. (1) Credit societies are of course fundamental. Anything of the nature of widespread defective management or mal-administration in them must go far to prejudice and weaken the whole movement. It is perhaps hardly necessary to insist that punctual payment of sums due by borrowers, except, perhaps, in circumstances of very special agricultural calamity, is a matter of cardinal importance. It is here perhaps that the real extent to which the co-operative spirit has

taken root, and its benefits appreciated, can be most effectively tested; and here also that laxity is most likely to show itself. It is a point on which official supervision must necessarily be strict for a long time to come.

As regards the other types (non-credit) of societies specified, I confess to a feeling of astonishment, after perusing the latest Annual Report on Co-operative Societies in the Punjab, at the progress which is apparently being made, coupled with a modicum of scepticism about the permanence of some of the recorded developments. Societies for aggregation of fragmented holdings and some other types seem to have taken firm root.

(*c*) See reply to Question 7 (*c*). Yes, I am inclined to think that legislation in some, if not all, of these cases may ultimately be necessary. It should, I think, be confined to schemes promoted by registered co-operative societies. It is probably too early yet for such legislation. Experience has still to show how far these non-credit types of co-operation—specified in detail in Question 22 (*b*)—will spread effectively. Until some estimate can be reached of the extent to which they will be given practical application, legislation is likely to be premature and possibly prejudicial.

QUESTION 23.—GENERAL EDUCATION.—(*a*) General education is obviously an immense subject. The mass of the rural population is mainly concerned with (iii) primary or elementary school education, and in a minor degree with (ii), the middle school grade. The first is in my view by far the more important, so far as rural areas are concerned, its essential objects being (1) to impart literacy, that is to say the possession of the primary instruments of intelligent activity, the three R's; and along with it, (2) the development and elementary training of intelligence. Moral training is of course a third essential, but it is perhaps not necessary to deal with it in the present connection. If such is the nature and function of primary education it is unreasonable to expect that any form of vocational instruction in agriculture, properly so called, can have a place in it. The same applies to education in the middle stage, regarded as a higher development of the primary. But as I have suggested under Question 2 there seems to be good reason for including instruction in the elementary facts of botany, agriculture, and agricultural processes in the curriculum of rural education. The vocational and technical instruction in agriculture, or indeed in any other occupation, can only be successfully imparted on a foundation of sound general education. The primary education of the entire mass of the rural population is, I consider, desirable in the highest degree, as being an indispensable means to agricultural efficiency in its varied aspects. Whether it is possible, or ever will be so, is, of course, a very different question. Towards universal rural literacy comparatively minute progress has so far been made, and I am disposed to believe that in fact little substantial progress can be made under the existing voluntary system; that, in short, without compulsion universal literacy in India is and will remain impossible. On the other hand the obstacles in the way of a policy of thorough-going compulsion are clearly enormous; obstacles social, administrative, financial, with which it is not necessary or possible to deal here. I am aware that the matter has been taken in hand and that compulsory powers have been given to local bodies in a good many rural areas. But the results have still to be seen, as regards quantity, quality, and financial cost. If they are favourable, a very real advance in agricultural and rural efficiency will be visible, distant though the view may be.

As regards the existing voluntary regime, with all its inevitable defects as an educational system, much attention has, I understand, been given of late years to the methods and principles of primary education. Indeed, the process had well begun before I left India. The main desideratum is that the education of the agricultural and rural boy should proceed in the closest possible relation with the common objects and processes which lie before him in his daily life, that his intelligence should be evoked and developed,

his mental powers trained, in terms of things with which he is constantly in touch. For a future Punjabi cultivator such education, if not vocational, is at any rate pre-vocational.

(*b*)—(i) Up to recent times, at any rate, rural education, if carried beyond the primary stage, has, I think, tended to draw the son of the cultivator from immediate contact with the land to professional and, where possible, to official occupations. Rural education, no less than urban, has been popularly regarded in a purely vocational aspect, as a road to an occupation economically more lucrative and of higher social account than agriculture. The process is, I think, likely to continue more or less unchecked until literacy and more advanced education are far more widespread than is the case at present. When the youth, educated up to the middle or higher stage, finds himself an individual in a literate or educated rural community, and therefore not differentiated therefrom by reason of his education, the impulse towards abandoning interest in or connection with his ancestral occupation will probably be less than it is at present.

(ii) I have no actual experience of compulsory education in rural areas, but I have not infrequently discussed the subject with the cultivator. Occasionally I have found a comparatively enlightened individual who half-heartedly approved of compulsory education as a more or less disagreeable necessity, but the majority were, almost invariably, decidedly opposed; generally on the ground that it would deprive them of the assistance of their youth in household work, cattle tending, and so forth, without any very obvious return of material advantage.

(iii) Such is probably the explanation or partial explanation of the small proportion of older boys in rural primary schools.

QUESTION 24.—ATTRACTING CAPITAL.—(*b*) The question refers, I imagine, mainly to the larger and more wealthy landowners. The comparative absence of improvements carried out by such persons I should attribute to economic inertia and narrowness of economic vision. There is a tendency to regard land as a means of production which should yield income freely without receiving freely.

It has been sometimes contended that the payment of land revenue to the State operates to discourage and hinder improvement. The contention is, in my view, baseless. For a long time there have been definite rules for the protection from land revenue assessment of agricultural improvements carried out with or without aid from Government loans, the protection being extended for such period as may be sufficient to secure recoupment of the initial capital expenditure with interest. That the land revenue is not an inhibiting factor is more than indicated by the large number of irrigation wells which have been sunk within the last 30 or 40 years by peasant landowners, frequently with the aid of *taccavi* loans.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*b*) Such enquiries are, I think, decidedly useful if carried out on sound lines. Work of this kind has been done in recent years in two villages of the Hoshiarpur district, and possibly elsewhere also in the Punjab. It is necessary that the investigator should have a good knowledge of rural economics, theoretical and practical, and be acquainted with general agricultural conditions. It is, I think, desirable that he should generally be a non-official, and that he should approach his task as far as possible without prepossessions or prejudices, political or economic, as to the results he expects, or perhaps wishes to find. At the same time all available official statistics and information should be placed at his disposal. During his enquiries he must reside in the vicinity of the village concerned, and with as small an entourage as possible. His enquiries should include, *inter alia*, detailed investigations, statistical and other, into the economic life and circumstances of several typical agricultural and artisan families. Needless to say great tact and

sympathetic understanding are requisite for all this. Such enquiries if properly carried out can supply fairly reliable data for sound generalisations.

QUESTION 26.—STATISTICS.—(a) (ii) This is a matter of the greatest importance, for the purposes of technical agriculture as well as for those of land revenue administration. The Punjab land revenue assessments turn very largely on the money valuation of rents-in-kind paid by tenants-at-will, and in this connection estimates of crop yield are clearly of the greatest importance. Various methods have been in force for arriving at such estimates, but none of them have, I fear, been satisfactory from the scientific point of view. Estimates of average yield adopted for assessment purposes have probably been somewhat below the mark, but not, I am disposed to think, so much so as is sometimes suggested when the wide interval between the limits of variation in the yields of particular fields is left out of consideration. In statistical language the standard deviation in the case of crop yields, especially in the case of unirrigated crops, is probably large. This factor necessarily tends to depress the average figures which can be safely used for assessment purposes.

A scientific procedure for ascertaining average yields of crops in different tracts is, I consider, very necessary. A principal part in the work must be played by the staff of the Agricultural Department, and, under its instructions, much assistance can be rendered by the revenue staff of the districts. In fact the co-operation of the latter is indispensable. Selected private agency, working under specific instructions, will doubtless be of much use. The work must be continuous, and careful up-to-date records must be maintained. The payment of a reasonable fee to the cultivator whose field may be the subject of investigation will be desirable.

(v) In this connection I would invite attention to the end of paragraph 13 of my general Memorandum. An expert agency for the scientific treatment of agricultural (and other) statistics is, I think, very desirable. At present, or, at any rate, up to a recent time, far too little use seems to me to have been made of the methods and results of modern statistical science. I suggested tentative action in 1916, but war conditions prevented anything definite being done at the time. The matter is, I think, one which deserves and will repay attention.

Oral Evidence.

52,520. *The Chairman*: Sir Patrick Fagan, you were from 1916 to 1922 Financial Commissioner in the Punjab?—Yes.

52,521. Your note is a very complete presentation of your point of view, but there are just one or two points I should like to ask you about. I judge from your note that in the main you think it likely that any improvement in the cultivator's standard of living must come from a change-over from subsistence farming to the growing of saleable crops?—Yes, I think that is the general trend: a more economic view of his work.

52,522. And, in your judgment, before a change-over of that nature takes place, should the matter of marketing and communications receive attention?—Yes, certainly, I think that it is a most important element in introducing a more economic outlook and a more economic stage of agricultural production.

52,523. On page 56, you are writing about the fragmentation of holdings, and you are suggesting that recalcitrant minorities may require compulsion?—Yes, it is quite possible; I think that some form of compulsion to enforce the wishes of the majority will be more or less inevitable in time.

52,524. Would you compel a considerable minority to conform?—It is rather difficult to give a reply to a general question like that; I think that

it would depend a good deal on the merits of the case; but, on the whole, I should be inclined in ordinary cases to exercise compulsion on a considerable minority, of course after hearing them completely and their reasons against the consolidation; but if there appeared to be no reasonable objections, I do not see why compulsion should not be exercised.

52,525. But when you come to the point of drafting a Bill which is to include compulsion as a principle, it would be necessary to make up your mind as to what proportion of the total you were prepared to coerce?—It would be necessary to lay down some general lines, but it seems to me a thing in which you would have to leave a good deal of discretion to the deciding authority. I have in mind that, in cases such as we have in revenue partitions, one has to exercise discretion as to how far the parties are to be compelled to adopt a particular mode of partition.

52,526. *Sir Henry Lawrence*: Then, in what terms would you draw up the law? Would you say that twenty-five per cent. opposition should be disregarded or thirty per cent.? Something must be laid down definitely in the law?—Yes, probably. It is, of course, extremely difficult without going into the matter on the spot and seeing more of it than I have. I should think somewhere in the neighbourhood of twenty-five to thirty-three per cent. would be reasonable. I should not like to give a definite opinion unless I had gone into the question on the spot in a good many concrete cases. It seems to me that any legislation on this matter must be the fruit of fairly extensive experience; therefore, I have suggested that I do not think it would be a sound thing to legislate straight away. It seems to me that there is a considerable area, especially in the Punjab, where a great deal can probably be done for some time to come without compulsion, and that the experience that would be gained in that process would throw light on the question of what sort of minority one ought to be prepared to compel. I should think, roughly, twenty-five to thirty-three per cent. might be a reasonable figure.

52,527. *The Chairman*: On page 50 you are discussing the question of marketing?—I am afraid I am rather behind the times in that matter.

52,528. You say: "I have come across cases in which the large European firms merely finance direct export, via Karachi or Bombay, by the local up-country dealers, taking as their remuneration interest on the sums advanced plus a commission on the amount realised by the sale of the exported commodity in the English market." Who ships?—The case that I had in mind was one that came to my notice at Fazilka, in the Ferozepore district, which is a great wool market. It was many years ago. That was the system; the dealers were in direct communication with the English market, and these firms used to finance the export and take their remuneration in the way I have stated.

52,529. You go on to tell us how the markets have grown in certain districts in the Punjab; have you any views as to the bodies which should control and administer these country markets?—As far as I remember, the practice was that generally the District Board projected the markets, acquired the land, disposed of the sites to purchasers and to people who wanted to build shops; after a few years, when the market had been built and had developed, it was made into what is known as a notified area under a small committee of its own. So far as I remember, that plan worked fairly well; the committee administered the area as regards sanitation, buildings and so forth.

52,530. In your recollection, had the cultivators direct representation on the body administering the market?—I do not think that they had, as far as I remember.

52,531. Would that be desirable, in your view?—I think it would.

52,532. On page 51, you give it as your view that the employment of grain elevators at railway stations would no doubt be beneficial. Have you

studied that matter?—No, I am afraid that my remark was not more than a suggestion. I remember that an elevator was built at Lyallpur, but when I saw it it was not in action; it had not been in action and there did not seem to be much prospect of it being used; but it seems to me to be a development which in time might function very usefully. I saw one working in an Indian State, Faridkot, but it was in the very early days, and I think it was rather more a show thing than used in actual practice. I think that there would be, in time, a fairly considerable field for such a system, especially when better and cleaner wheats are available. I think that it would help marketing a good deal.

We saw the elevator at Lyallpur when we were there, and it was still what the theatrical profession call "resting."

52,533. I want to be certain that I understand what you mean on page 53, in answer to our Question 5, Finance: "funds needed for domestic objects more or less indirectly connected with agriculture." What exactly were you thinking of there?—I should say general domestic objects.

52,534. Financing domestic expenditure between crops?—Yes, between crops.

52,535. *Mr. Calvert*: Milch buffalo?—Yes. I mean that if you do not include general domestic objects, then the cultivator will go off to the moneylender, necessarily. You want to get as many of his financial transactions as possible and, if possible, all of them; I think that is a principle which is essential.

52,536. *The Chairman*: In answer to the same question, you are dealing with the matter of *taccavi* loans, and you set out some of the factors which have limited the scope and usefulness of those loans. Would you add that their unpopularity in certain districts may have been due to leakage between the source of the loan and the cultivator's pocket?—Yes, I think that is quite possible; in fact, I should say it is an almost inevitable element.

52,537. In your experience, is that leakage considerable?—It takes more the form of a tip, on a more or less liberal scale, in order to oil the machinery. It is, I think, mainly in that way that leakage occurs; I do not know that it is necessarily a proportionate deduction from a loan; it might be in some cases, but I think the general process is a more or less liberal tip or some other gratification, as I say, in order to oil the wheels of the official machinery.

52,538. But not granted merely for the pleasure of giving?—No, I think not; it is given, more or less, for consideration.

52,539. *Professor Gangulee*: Is there a considerable delay in getting this loan? That has been said to be a factor?—Under the Agriculturists Loans Act, where the distribution is very often on the spot, I should think that the delay was less than with improvement loans. In the latter cases the procedure was more complicated and some calculation of instalment was required, though a good deal of that work was done afterwards. The delay was more, I think, over the improvement loans than for the others, because the improvement loans were not generally distributed on the spot, whereas with regard to the agricultural loans for bullocks, seed and so on, especially in times of scarcity, there was peripatetic distribution, and I think that they were generally issued more quickly than the others.

52,540. *The Chairman*: On page 62, in answer to our Question 23 on General Education, you make the interesting suggestion that when bare literacy becomes more general, its existence is less likely to disturb the individual enjoying it because he will not feel himself marked out for promotion?—Yes, that is my idea. When there is a general atmosphere of education, the educated youth will be more inclined to say: "I am very much as the people round me; what is the object of going away?"

52,541. Have you noticed that?—I am afraid I have not, because the atmosphere of the Punjab village in my days was certainly not educated; I think there was a tendency for the boy who had been educated, certainly beyond the middle stage, to feel that he could do a great deal better for himself than in the village, and his parents very often felt very much the same, though not always. A certain number of them did regret that education drew youths away from the fields, but at the same time they were all quite keen on their sons getting official posts.

52,542. In answer to Question 25, on the general matter of the welfare of the rural population, you give it as your view that village surveys might well be carried out by unofficial persons?—Yes.

52,543. Would they require to be members of some organisations?—I think that they would have to work in connection with some central organisation. One or two which I remember were carried out, more or less, in communication with and under the encouragement of the Punjab Economic Board. I certainly think that it would not do to have a person going out on his own, so to speak; he should work under some organisation or agency which would indicate to him the general lines of research and also help him.

52,544. Have you thought at all of the possibilities of the Indian Universities taking up studies of this nature?—That was the sort of agency that I had in view; I mean graduates who would approach the task with an open mind, without bias in any particular direction. I do not say they would be all biassed in one direction; they might be so in various directions. I think that bias is a danger which would have to be borne in mind.

52,545. Such surveys are not of very much use, are they, unless they are carried out by persons thoroughly well instructed as to the method of pursuing them?—Yes, I certainly think it would have to be somebody with expert knowledge of general economics and also, of course, familiar with agricultural conditions. I do not for a moment contemplate that you could depute anybody to do it; it is certainly work for experts: for somebody who is interested in it and also has some organised information about its principles and also about the details.

52,546. On page 64 of your note, you suggest that where the average yields of crops have been worked out by reference to particular fields, the payment of a reasonable fee to the cultivator whose field may be the subject of investigation will be desirable. Is there any particular reason why he should receive a fee?—The experiment would mean a certain amount of trouble and possible loss to him; he might have to put up with delay in reaping, cutting and in some of his agricultural operation; it might hamper him in certain ways.

52,547. *Sir Henry Lawrence*: In your remarks on compulsory education on page 62, you state that without compulsion universal literacy in India is and will remain impossible?—Yes.

52,548. You go on to say: "On the other hand the obstacles in the way of a policy of thorough-going compulsion are clearly enormous; obstacles social, administrative, financial, with which it is not necessary or possible to deal here." Could you develop that? Could you tell us what these obstacles are?—Administratively, I should say, one obstacle is the number of teachers required. It seems to me that the problem of education in India is very largely, though not entirely of course, the problem of the qualified teacher. If you had this enormous extension, no doubt the number of teachers would increase, but I think that there would probably be very considerable difficulty in getting an adequate number of qualified teachers. You must have your teachers thoroughly up to the mark or it is a question of the blind leading the blind, which I think in the past has operated a good deal to prejudice the cause of Indian education.

52,549. What are the financial obstacles?—The principal one is the cost; I should think that, without extra taxation on a fairly substantial scale, anything like complete compulsory education would be impossible.

52,550. Have you made any estimate of what the cost would be in your Province?—No, I have not. I am bound to say these are merely my impressions; I have not had the materials to make a calculation. There is a book which has recently been written by Mr. Mayhew on Indian Education. I daresay the Commission has seen it. I think he makes a certain amount of the financial point, though I believe he is strongly in favour of compulsion. But it does seem to me that the financial aspect would certainly be a limiting condition for some time to come. Then as regards the social obstacles, I am only talking from experience in my own time. The zamindar certainly did not contemplate compulsion with any favour, that is to say, generally, largely for the reason that it would deprive him of the work and assistance of his boys, in looking after cattle and in other matters; and there would be, I have no doubt, other difficulties of the same kind. Very possibly they are wearing away. From what I gather, in the Punjab compulsion has been extended to a very large number of areas, but still I think that there would be considerable social difficulties and certainly in the more backward parts of India.

52,551. Do you envisage compulsion for girls as well as boys?—I suppose ultimately that might come, if it succeeded with the boys; of course, for complete literacy compulsion would be necessary as much in the case of girls as boys: possibly more so. It is an enormous subject, and I do not think that one can run away with the impression that compulsion is necessarily going to succeed. But it does seem to me that unless we can have compulsion of boys in the first place, and probably of girls later on, India in the mass will remain illiterate.

52,552. Do you anticipate actual physical opposition to the enforcement of such a measure?—No, certainly not, unless it is carried out in the most tactless manner. It certainly is a thing for which a great deal of tact and care will be required, especially in some parts. I should think the hill tracts and backward localities would probably not understand it, and if the pace were forced I think it might lead to something in the way of violence in such places. I do not think one can afford to force the pace in any direction in these matters of development.

52,553. Does the machinery exist, or can it be created, for enforcing it in the shape of magistracy to deal with fines and imprisonments? Would the existing magistracy be sufficient to deal with it?—It is difficult to say. You could take tracts where they were not very unfavourable to it, as I understand is the principle in the Punjab now. They select particular *zails*, which are sub-divisions of *tahsils*, where there seems to be some feeling in favour of compulsion. I do not suppose that in those, there would be very many of these cases of bringing people before magistrates.

52,554. That is dealing, not with universal compulsion, but with selective compulsion?—Yes.

52,555. You do not contemplate universal compulsion at all?—Not straight away: it is a thing which has to come gradually.

52,556. *Professor Gangulee*: The first stage in your opinion would be selective compulsion?—I think so, certainly.

52,557. *Sir Henry Lawrence*: Have you advocated any method of increasing literacy by voluntary measures leading up eventually to compulsion: any measure that will induce agriculturists to keep their children at school after the fourth stage of primary education?—I do not think that, apart from the spread of education itself, there is very much chance; the two things seem to me to act and react on each other: the more literacy you have the less will be the impulse for the educated boy to leave the village. There is also adult education.

Sir Patrick Fagan.

52,558. That is not quite my point. You know that at present, when boys go to primary schools, three-quarters of them, roughly, leave the school and leave primary education before they get to the fourth standard?—Yes, quite so.

52,559. How can you induce their parents to keep them in the primary school after the fourth standard? Is there any means of bribing them or inducing them, or doing anything short of applying compulsory education?—I think probably something might be done in the way of making their education a little nearer their actual life. Some steps have, I believe, been taken to do this. If the agricultural boy were educated more in terms of things that he is in touch with every day, possibly that would tend to lessen the tendency to leave the village. I imagine that the agricultural father thinks thus: "After all, what has this that my son is learning to do with his daily life?"

52,560. At present the school curriculum is not popular with the rural parent?—I should not like to say at present because it is five years since I have been there.

52,561. Five years ago it was not popular?—I think that was certainly the tendency; but it was being lessened; I mean, attention was being paid to that fact and had been for some years; but still the tradition was amongst the agriculturists that after all there was not much practical point in education.

52,562. On page 42 of your note, paragraph 5, item 4, you recommend the encouragement of industries, as far as possible of a domestic type, supplementary to agriculture?—Yes.

52,563. What measures have you in view for the encouragement of those industries?—I should think that demonstration is probably the best line along which to attack that problem; first of all investigation and then demonstration; find out what can be done and then demonstrate that it is possible.

52,564. Which do you regard as of greatest importance to the cultivator; the external export market for his products or the internal local markets?—I am afraid I am not sufficiently versed in that matter. The external market has been of great importance in the Punjab, especially in the Colonies. By external, do you mean foreign?

52,565. Yes, I mean the foreign export trade?—As a matter of fact, the internal market is the biggest; the proportion of agricultural products that is exported is comparatively small compared with the total amount produced, and in that sense, of course, the internal market is the more important.

52,566. Do you recommend the encouragement of industries with a view to providing a local internal market for agricultural products?—I had more in view supplementing the agriculturist's income. To increase the rural population by a mixture of industrialists would lead to a demand for agricultural produce; but my idea was rather that the agriculturist would take up domestic industry as an addition to his income and in his spare time, so that more of his time would be devoted to improving his own economic position.

52,567. Within the last few years there have been two Committees and Commissions to deal with industrial development: the Industrial Commission under Sir Thomas Holland and the Fiscal Commission?—Yes.

52,568. Do you know if any action, or in your opinion has sufficient action been taken by the Government of India to carry out the recommendations of those Commissions?—I am afraid I have not followed the matter sufficiently closely to be able to give a reply.

52,569. Do you know if any machinery exists in India to watch the working of such industries in India?—For co-ordination of investigation and so on?

52,570. Any machinery, the object of which is to develop internal industries in India; are you aware of any such machinery as being in existence?—No, I am afraid I am not sufficiently acquainted with this subject to be able to answer that question.

52,571. *Sir Ganga Ram*: On page 42 of your note you say: "The true remedy appears to lie mainly in two directions: (1) the application of more capital." Where is that capital to come from? Do you mean that the Government should provide the capital or what?—I look to co-operation very largely to supply co-operative credit, and the ordinary money market would more or less come in through co-operative credit.

52,572. Do you mean that Government should contribute something towards that?—No, I had not that definitely in view; my idea was that the capital should be the agriculturist's own.

52,573. They have not got much capital?—But through co-operation they are put more or less in touch with the general resources of the country in the way of capital.

52,574. When you advocate the development of agricultural industries, what sort of subsidiary industries have you in mind?—I should suggest textiles.

52,575. Do you mean the *charka*?—No, not the *charka;* I had in view something in the nature of artistic textiles. I admit that it is a long way ahead and it would require a lot of preparation, but it seems to me that it is possible that in parts of India something of that sort might be developed.

52,576. You cannot give us any instances of any industries which are in your mind?—In my replies, I refer to some woollen material which used to be made in Bikanir 35 years ago.

52,577. What was that?—They were mantles which the women wore; I have some in my house at the present moment; we are using them as curtains. Of course, that is a very small thing, but it seems to me possible that something in the way of developments of that kind might be encouraged, I do not say all over India, but in places. Then there are things like sericulture which are all more or less in the experimental stage.

52,578. There is a religious objection to the textile industry; the Jats will not take to weaving?—Yes, weaving is looked down upon. These are just the things which you must do gradually; there is no royal road; you cannot say: "These are the industries which you must immediately start." I think *solvitur ambulando* is the principle which should be followed with regard to domestic industries. It does not take one very far immediately, but I do not think India can be developed agriculturally in five or ten years.

52,579. You advocate "the wider application of science to Indian agriculture and changes in the class of crops now usually grown on small holdings"?—That is the sort of thing I had in mind, something in the nature of market gardening and fruit.

52,580. Vegetable gardening?—Yes.

52,581. In that case you would recommend that the Canal Department should offer a special rate for water for that purpose?—That depends on the amount of water available; I understand it is not very abundant.

52,582. At the ordinary rate for water, no gardens can be cultivated?—That is, of course, an economic question; I think that the department certainly might do all it can to encourage that kind of cultivation.

52,583. On page 43 you say that the work of the Agricultural Departments "demands a substantially greater net annual expenditure." Can you say how much? How much would you recommend for the Punjab, for example?—I am afraid I cannot commit myself to giving any definite figure, but I think that there is ample room for more expenditure.

Sir Patrick Fagan.

52,584. Further on you say: "Whether the position of agriculture as a 'transferred' subject will or will not have a prejudicial effect on its development remains to be seen." Do not you think making agriculture a transferred subject was a mistake?—That is rather a big question; I do not think I can go as far as that.

52,585. I ask you for your own personal opinion?—I think probably it was wise to transfer it, but subject to retaining some power of control provincially, and, probably as more necessary the Government of India also. I think the idea at the back of the transfer was probably correct, if there were to be such things as transferred subjects, but at the same time I think it would have been wise to have retained some power of authoritative control, at all events, in the Provincial Government, if not in the Government of India.

52,586. You cannot give us any indication of the kind of control you suggest?—It is very difficult, but my general idea is this, that you must have a certain amount of co-ordination in things like research and experiment over a large field like India. After all, agriculture is an Indian problem, though it is a group of local problems as well; on the whole, it is an Indian problem, and I think that you must have some organisation, and that the Government of India must in some way function as a co-ordinating and directing power in investigation, experiment, research and so on. It seems to me that for that purpose they must have some form of authority, however limited or modified. That is my general view.

52,587. On page 44 you say: "By pasture is not meant, of course, the mere uncultivated waste known in the Punjab and elsewhere as *banjar*." The *banjar* receives the rainfall just as much as the other land, but that rainfall is not absorbed into the land. Would not you be in favour of passing a law preventing any land from being left unploughed? All that rainfall which falls on the *banjar* land goes into the rivers and flows away?—Yes, it flows away into the village tank and other places.

52,588. All these *banjar* lands receive as much rainfall as other lands; therefore, unless that rainfall is absorbed in the land it does no good, but, on the other hand, it does harm?—Yes.

52,589. Therefore, would you favour the idea of bringing in legislation to prevent any land, whether *banjar* or otherwise, from being left unploughed?—I should not think legislation would be quite wise in a matter of that sort.

52,590. Would not you do that in the interests of the public, because it harms the public?—It does, but then I think you have to get the public to wake up to that fact. In one aspect that is the whole problem; you have to make people see, and I do not know that legislation in a matter of that kind would be quite the best way to do it.

52,591. Or might pressure be brought to bear on them by some method of assessment? You recognise the necessity of it?—Yes, I think it would be a very good thing if they could be induced to apply some capital and labour to some of their waste lands, so as to bring them something nearer to what one understands by pasture. I quite see that, but I do not think that legislation is quite the best way to do it.

52,592. Not by any method of assessment or fine? You do assess the *banjar*, do you not?—In former days, when there were large blocks of *banjar* which really yielded profit they were assessed; but in modern times the waste is generally left unassessed.

52,593. I see you advocate compulsory education; is that in rural schools too?—Yes, for primary education.

52,594. Do not you think you would take those boys away from their occupations?—You would, I suppose.

52,595. To the disadvantage of cultivation?—Yes; so far, of course, there is harm, but then on the other hand there would be compensating advantages in time.

52,596. Are you aware of the fact that in the last census it was found that most of these boys after they have left school a couple of years forget even their letters?—Yes, I know; I have come across some of them myself; I have examined them some years after they had left school and they did not appear to know much.

52,597. Then, would you propose that they should continue to have some sort of adult education in the village?—I think if you have a number of people who can read and write in a village, then the man who can read and write has less chance of forgetting what he has learned, because he has more occasions for reading and writing.

52,598. You know that in the last war there was a great pressure on the Punjab for recruits?—Yes.

52,599. Do not you think you might adopt a system by which scholarships or stipends would be given to selected boys for them to go to school and be trained while wearing the uniform, or something like that?—You mean to go into the Army?

52,600. Yes, to go into the Army so that they will be enlisted beforehand and will undergo training; I am merely suggesting that to you?—I am sorry, I do not quite follow.

52,601. A boy who is of good physique and wants to join the military profession may be given a rupee or two rupees a month scholarship from the very beginning, so that you will have a list of recruits ready, and in that way you could induce boys to follow the military profession?—I have not thought of that, but I think on the whole the Punjab is not backward in recruiting.

52,602. It would, of course, only apply to the Punjab?—I am afraid that is really the only Province I can speak about.

52,603. You know all the pressure that was brought in the Punjab to get recruits in the war?—Yes, and very nobly they responded to the call.

52,604. There is a proposal to introduce elevators everywhere?—Yes.

52,605. Do not you think elevators can only do good when they are not more than 10 miles apart; if they are more than 10 miles apart the grain would have to stop on the way?—I have no doubt there is some limit of the distance at which they ought to be from one another, but what it is I should not like to say.

52,606. You advocate the extension of the dairy industry?—I should think it is a possibility that ought to be explored in the neighbourhood of big towns.

52,607. In view of the religious sentiment, do you think any Hindu or Muhammadan can run a dairy industry with profit?—Perhaps they are not able to do so at present, but I think it is a development for the future.

52,608. If a law were drawn up to limit the area below which the land was not to be partitioned, what area would you consider necessary for a plough, irrigated or unirrigated?—I suppose for one plough between 10 and 15 acres of canal irrigated land would be required; the size in regard to well land would depend on the depth of the well, but I suppose it would be about five to 10 acres, and with *barani* land I suppose you could have from 20 or 25 up to 40 acres according to the nature of the soil.

52,609. At the end of paragraph 11 of your note you say: "Any methods scientifically calculated to render dry (rainfall) agriculture more secure by an economy of soil moisture would be invaluable." Have you any particular method in mind?—I believe that in America they employ deep ploughing for such a purpose. How far deep ploughing is possible in India I am not sufficiently expert to say, but that was the sort of thing I had in mind.

52,610. With a tube well?—I had more in mind dry cultivation on rainfall alone.

52,611. In America they sow some seed which stands drought?—Yes, drought-resisting seed. That is one of the things I had in view.

52,612. Is it not your experience that land where lift irrigation is possible is now very much sought after in the Punjab?—It is five years since I was there, as I have said. I cannot say that lift irrigation was run after in my time; people much preferred flow irrigation.

52,613. I am not suggesting they prefer lift in preference to flow, but lands which were formerly left as uncommanded are now sought?—No doubt they are if they have the proper appliances for lifting.

52,614. *Sir Thomas Middleton*: On page 44, you point out the value of the dairy industry to the small holders of Europe and America and suggest that there is a great possibility of expansion in India, especially in the Punjab?—Yes.

52,615. What is the demand for dairy products in the Punjab? Is there a big market for milk and *ghi*?—There is a big demand for it; milk and *ghi* play a very large part in the ordinary Indian dietary; certainly in the big towns there is, I should say, a very considerable demand and a very inadequate supply: inadequate perhaps more in quality than in quantity.

52,616. An unsatisfied demand exists?—Yes.

52,617. So that assuming the small holder took up the dairy industry, he would find a market?—I should think so.

52,618. You indicate the great need for what you call real pasture: not waste land but real pasture. How is such real pasture to be obtained under Punjab conditions?—I suppose by something of the nature that Sir Ganga Ram was suggesting: ploughing, tillage and irrigation, and probably a certain amount of fencing, reservation, and so on.

52,619. You are thinking not of permanent pasture such as we have got in this country, but temporary pastures?—I was thinking more of permanent pasture, but it is a thing which does not at present exist, so far as I know: certainly not in the Punjab plains.

52,620. It could not exist without irrigation in the plains of the Punjab?—I think not.

52,621. That would presumably mean very low rates for water?—It would depend, I suppose, a good deal on what sort of economic position the industry attained. Probably it would have to be very low.

52,622. But in fact for the plains of the Punjab it is temporary pasture and not permanent pasture which would be most likely to be economic; is not that so?—I should think so probably. I mean "temporary" in the sense that grass will not always be available.

52,623. I mean "temporary" in the sense that it is laid down for one, two or three years and not permanently as our pastures are in this country?—My idea would be that it would be permanent in that sense; whether they would always be green or not would be another matter, but it would be permanent in the sense that there would be particular irrigation outlets for it and the situation would be more or less fixed; my idea was not so much that it would come into an ordinary agricultural rotation.

52,624. No, not necessarily, but in effect it would be a type of forage crop?—Yes, something between a forage crop and a permanent pasture.

52,625. I think the Punjab Government have already reduced very much the water rates for fodder crops?—I believe they have; I think they had begun it before I left.

52,626. So that encouragement is being given to that kind of farming? Yes.

52,627. Then you make a point of the importance of veterinary practitioners in treating live stock disease?—Yes.

52,628. What is your view as to the present number employed in the Punjab? Is the number of veterinary assistants adequate or very inadequate?—I cannot answer for the present, but in my time certainly it was not adequate.

52,629. It was inadequate?—Yes, there was scope for many more, for a considerable number more.

52,630. *Sir Henry Lawrence*: For ten times as many?—I do not know that; I should not like to say exactly, but we could have done with a great many more.

52,631. *Sir Thomas Middleton*: You knew of cases where many cattle were lost because veterinary assistance was not available in time?—I cannot call to mind definite instances, but I know there was a very great and extensive mortality which might have been prevented if more officers had been available.

52,632. You lay great emphasis on the value of agricultural education?—Yes.

52,633. You have seen the initiation, the rise of the Punjab Agricultural Department, and its extension almost up to the present limits, I think, within the period of your service?—Yes, it began in my time.

52,634. Are you satisfied that in starting that department the Punjab Government made a good investment?—Financially?

52,635. Yes?—Yes, I should think so; I have not worked out figures.

52,636. It was a good investment?—I should certainly think so financially. Of course, there are other aspects of it too, but I should think financially that would be so. Whether the return has all come in yet is another matter, but I should say financially it must have been an excellent investment.

52,637. And your experience would lead you to think that development in the direction of the development of 1912 to 1922 is desirable?—Yes.

52,638. In watching the development of that department were there any mistakes in policy or procedure that occur to you that you could point out to us?—As a matter of fact, my sphere of duties lay rather with land revenue and assessment; it was my colleague who dealt with agriculture.

52,639. It was your colleague who, as Financial Commissioner, dealt with agriculture?—Yes; occasionally I had charge of it for a brief period when he was absent on leave or otherwise.

52,640. I was assuming you were the Financial Commissioner in charge of agriculture?—I was not; my colleague really had charge of it.

52,641. From the importance you attach to education, I take it that you are thoroughly in sympathy with the experiment which the Punjab Government initiated in your own time of introducing teaching in agriculture into the middle vernacular schools?—It was actually started after my time, but I am in sympathy with it. At the same time, I regard it as something less than actual vocational teaching; it does not seem to me that in the middle school you can turn out a finished farmer.

52,642. It is intended to be less than vocational?—Yes.

52,643. It is intended not to be vocational?—Yes, pre-vocational perhaps.

52,644. We have got two stages to think of in agricultural education: we have got to get the people to think for themselves?—Yes.

52,645. Your vernacular school is trying to educate a population who will think for themselves?—Yes.

52,646. We soon come to the end of improvement if it is merely a case of cultivators accepting what is put in front of them?—Yes, quite so.

52,647. You have made reference to the importance of subsidiary industries; have you come into contact with the Rural Industries Bureau in this country, which exists for the purpose of stimulating industries of the type you mention?—No, I am afraid I have not.

52,648. You express the view that the Government of India should coordinate; is there any method open to the Government of India by which

it can co-ordinate, except the power of the purse, under existing conditions?—Under existing conditions I should imagine not. I understand that agriculture is wholly transferred and all that the Government can do is to say: "If you will do so and so, we will give you so much," which is the sort of thing that goes on in this country, I believe, in regard to local bodies.

52,649. Reference was made to the fragmentation of holdings and to the desirability of limiting fragmentation; but, supposing we were to take such figures as you suggested: 5 acres to 8 acres for well irrigated land and 20 to 30 acres for *barani*, and so on, what would you do with the dispossessed agriculturists?—I merely gave those figures; I did not express an opinion as to the desirability of limiting things in the way which was suggested.

52,650. Then I misunderstood you?—The suggestion, I think, was that partition below a certain area should be forbidden.

52,651. If it were forbidden, what is to happen to those who are squeezed out, as it were?—That is my difficulty; I do not quite see how it is to work; the actual legal partition could be prohibited, but there would be nothing to prevent the co-owners cultivating in separate plots, as happens now. I mean that a great many of the partitions effected do not get into our records at all.

52,652. The property may be worked in common?—Yes, in common or in separate blocks; a very great deal of joint land is worked in the latter way.

52,653. I misunderstood the proposal: I thought it was limitation to the eight acres holdings?—I do not quite see how that could be carried out practically.

52,654. I feel very strongly with you on the importance of growing commercial crops as distinguished from subsistence farming; but the difficulty is the very small size of the holding?—Yes.

52,655. With a very limited holding a man is forced to cultivate food only, because he cannot afford to sell and trust to selling his own produce and buying food: his operations are on so small a scale that he cannot enter into commercial farming?—Even of a mixed type.

52,656. Yes. That seems to me to be a very great difficulty with which cultivators in the Punjab and other Provinces on less than five acres are faced?—That is so. But I suppose if he went in for mixed farming, he would buy his food from the proceeds.

52,657. He could buy his food, but he must then pay the profits of the middleman on his buying?—That is so.

52,658. And that adds thirty to forty per cent. to the cost of his food?—Then comes in co-operative marketing which seems to me to be a necessary adjunct to farming on five acres.

52,659. I wanted to put that point, because it is a very difficult one in dealing with such small holdings?—Yes, it is.

52,660. Reference was made to the possibility of legislation imposing compulsion on a recalcitrant minority in the case of consolidation of holdings. In the first place if there were such a law, do you think that this in itself might injure the co-operative movement? It is voluntary at present; would the introduction of such legislation operate against the voluntary spirit?—That is the sort of idea that was present to my mind. I should like to defer legislation as far as possible until consolidation has gained momentum, so to speak, by voluntary means; then you would possibly have some sort of public opinion in favour of the adoption of compulsion. It seems to me that if legislative compulsion were adopted straight away it might engender some feeling of opposition.

52,661. What you want to have is power behind you without using it?—Yes, my experience has been that very often that is a very excellent

position to have in India in various matters. I think that is quite reasonable.

52,662. If you were proceeding on such lines, it would not be necessary to lay down the actual percentage of the majority in the law; the law might be something in this form, that where a majority of the owners in a particular village desire to consolidate their holdings, there is power to apply for a compulsory order. Then, as a rider to that, you might have. "Provided that no compulsory order shall be made if (say) the owners of sixty-six per cent. of the land, or seventy-five per cent. of the owners by number, do not make application." It would not be necessary to lay down the actual number in the law; it would be merely a limiting number?—Yes; I agree. I think that you would have to give a wide discretion to the authority deciding the matter.

52,663. Yes, that is so?—And if the minority were a comparatively small one, then you might say that the minority were to be compelled, but beyond that you would leave it to the discretion of the court.

52,664. That could be accomplished by making application for a compulsory order which would be granted by some authority, the law stating the minimum number of persons who could apply?—Yes, that could be done.

52,665. That could easily be accomplished?—It is, I think, essentially a matter for discretion, such as we have in partition cases now; a man or a group of co-holders apply for partition, and even there it is in the discretion of the revenue officer to refuse it altogether, for a sufficient reason.

52,666. If there were an Act giving a minimum figure, say, of 66 per cent., the person making the compulsory order might require 90 per cent. of the people to agree?—Yes.

52,667. *Mr. Noyce*: On page 41, in paragraph 2 of your memorandum, you refer to the mass of literature relating to the settlement of land revenue, and you say that it requires to be digested and co-ordinated. Have you any suggestion to make as to who should undertake it and how they should set about it?—It would require officers specially deputed, if not a department, but I should think that something in the shape of a statistical bureau might probably deal with some very useful aspects of it.

52,668. What is really wanted is a bureau of rural economics; that is the only machinery that could cope with it, I suppose?—I think I have indicated that more or less. It seems to me that you must have an economic branch of an agricultural department, to deal with the purely economic questions that arise, as apart from the technical and scientific questions.

52,669. In paragraph 4 you speak of a two-fold remedy: "(1) the application of more capital, with its necessary implications." Do you think there is any scope for the application of capital to a small holding, or are you thinking really that it would benefit the cultivator only indirectly?—I think that there is a certain amount; the sort of thing I had in mind was the small cultivator investing in a properly constructed pit for keeping his manure, or better sheds for his cattle with a masonry floor where he can use litter, and other similar improvements. All such things would mean more capital expenditure and possibly more useful employment for his time. I should think there are directions of that kind in which, even on a comparatively small holding, there is room for the application of capital.

52,670. He would get his capital from the co-operative societies?—Yes, that was my idea.

52,671. Do you think the "three acres and a cow" principle is really applicable to the small cultivator in India?—The mixed farm?

52,672. You cannot do much mixed farming on three acres?—I suppose there are comparatively few people who are actually cultivating three acres; they generally manage to eke it out in some way. There are districts such as Jullundur where the holding does work out at about three and a half acres per head, but then we generally found they are able to add to that some

more land on rent or otherwise, so that the cultivator gets for his plough something like eight or nine acres.

52,673. It is the cow I am thinking of; is not there a tendency, certainly in Western countries, against dairying on a small scale?—In Denmark, I believe they do it a good deal; I do not quite know the size of holding there. Of course, things are on a small scale in parts of India, but I do not see what else is to be done.

52,674. Market gardening, of course, is only possible near the big towns? —Yes.

52,675. When, in paragraph 13, on page 46, you speak of the application of scientific statistical methods to the elucidation of rural and agricultural problems, I suppose you are thinking of the sort of work that Mr. Jacob did when he was in India?—That is what I had in view; his work was mainly the correlation between rainfall, that is seasonal rainfall, and the crops. It seems to me there are probably a good many other problems of the same or of an analogous nature which might be treated usefully in that way.

52,676. On page 47 you say the provision of a two years' leaving certificate course is highly desirable. As a matter of fact there is such a course at Lyallpur?—Yes, I believe there is.

52,677. On page 52, in reply to Question 2, you say you consider the elementary facts of botany and agricultural processes should be imparted in schools. How do you propose to do that and provide sufficient time for the three Rs?—I think it would work in with the three Rs; such facts would be merely the material in which instruction would be given: reading and so on. I do not know that you would necessarily have a definite lesson in botany, but the teacher in his instruction would use botanical material as illustrations and otherwise.

52,678. Give the agricultural atmosphere in fact?—Yes, he would talk in terms of these things.

52,679. On page 62, you say that your admiration of the progress of co-operation in the Punjab is tempered with a modicum of scepticism as to the permanence of some of the recorded developments. Which of the developments were you especially thinking of?—I have not got a list of them, but there seemed to me to be one or two which are very excellent, but I rather doubted whether they would, so to speak, really catch on for some time to come. Of course, one has to try many experiments.

52,680. They are a little fanciful? Is that what was at the back of your mind?—Yes, some of them.

52,681. *Sir James Mackenna*: What are your views about the relationship of the Financial Commissioners to Government. At present there is a scheme in the Punjab by which they are Secretaries to Government, and there was the old scheme under which you worked under which you were not a Secretary to Government. Have you any views on that arrangement?—I do not know the practical working of it, but personally I was against it, possibly because I was wedded to old methods. It seems to me that it is not easy to combine effectively the two functions of a Secretary and a head of a department. I am disposed to think that the mixture of head of a department and Secretary to Government is likely to lead to difficulties. Of course, there are minor matters, such as dealing with files; I do not know what they do with their records or how they keep them separate, but that, no doubt, is a comparatively trivial matter. The Financial Commissioner used to be the Government's adviser in matters of land revenue and assessments, records, forests, and, of course, later, agriculture and other branches. It is not clear to me how this function can be satisfactorily combined with that of Secretary.

52,682. Would you consider the possible limitations on touring as a handicap too?—Yes, I must say I found that considerably in the last year of my service; I suppose it was inevitable, but much of my time was occupied in sitting in the Legislative Council, which I have no doubt was very

good for me; whether it was good for the Legislative Council is another question. But I found it did seriously interfere with one's opportunities of getting out into the districts and seeing how things were actually working on the spot. I felt that very much in the last year of my service.

52,683. Of course, if one were Secretary to Government, that is a further limitation on touring?—Personally, I do not see how the Financial Commissioner can do any practical touring at all if he is a Secretary, because presumably he has every week to attend on the Minister or Member with cases, and for other purposes.

52,684. In the present condition of agricultural development in India on which would you lay greater emphasis: the development of education or the development of communications?—Speaking for my own Province, I should say that on the whole education at the present moment is probably the thing that is more urgently wanted. I do not wish for one moment to minimise the importance of communications; I consider that they are most essential, but I think that the province is fairly well developed in that respect; I do not mean to suggest that anything like what is perhaps really necessary has been accomplished, but I think that we are probably more backward in education than in communications.

52,685. Then you would lay a great emphasis on education?—Yes, I think so.

52,686. Have you any views on adult education of a strictly literary type with a view to assisting men who may have been educated to regain literacy or in attempting to inculcate literacy in an illiterate adult?—I have not really seen the working of it; a wider spread of juvenile literacy is the real thing that is wanted; I think there is more to be expected from that than from trying to educate, or rather re-educate the adult. The latter is a very excellent thing to do and very beneficial, but it seems to me that advance will be attained on a greater scale by a spread of juvenile literacy than by education or re-education of the adult.

52,687. I think, somewhere in your note, you emphsise the phase of adult education which consists in the demonstration of a particular process to a cultivator which in his ordinary daily work he can understand without being literate?—Yes.

52,688. You would emphasise that form of adult education?—Yes, the lantern and such like.

52,689. *Professor Gangulee*: You have two Financial Commissioners in the Punjab?—Yes.

52,690. One, I understand, is in touch with the Ministers holding the portfolios of Agriculture, Co-operation and so on. How does that system work?—I have not seen it working and I cannot say, but I imagine that he is a Secretary mainly and also head of a department.

52,691. In a Province you have a Ministry of Agriculture, a Ministry of Education and a Ministry of Local Self Government: three Ministries in accordance with the Reform Act?—Yes, there are three now in the Punjab.

52,692. Do you think it is necessary to have one official, or non-official, to co-ordinate the activities of these three Ministries?—From the point of view of agriculture?

52,693. From the point of view of tackling the rural problem as a whole, is it necessary to have one individual like a Financial Commissioner or Development Commissioner?—I suppose that as far as the three Ministers go, the Governor is the co-ordinating agency.

52,694. You do not think any other agency is necessary?—No, I should not think so, between those three.

52,695. Turning to your note, I think you made it quite clear to us that you would like to see mixed farming and subsidiary occupations; is that your idea?—Yes, that is my general idea; it seems to me that it is more or less along those lines that development must run.

Sir Patrick Fagan.

52,696. Now, for the development of rural industries supplementary to agriculture, at the present time there is no organisation in the Province?—As far as I know, there is nothing very definite of that nature.

52,697. Do you think such an organisation would be useful in time?—I should think it would be very useful. It seems to me that these subsidiary industries are very necessary; I mean that if they can be called into active and healthy operation, the agriculturist would be very, very much benefited, and, so far, of course, organisation is necessary.

52,698. On the question of cattle improvement, how would you organise the whole subject of animal husbandry? It has been suggested to us that cattle breeding should be under the Veterinary Department. Would you recommend such an arrangement?—What I feel is that veterinary work, especially with reference to bovines, is so extraordinarily important for agriculture that the Director of Agriculture, or whoever is primarily responsible for the Agricultural Department of the Province, should be in a position to make his influence, knowledge and views really felt in everything that has to do with bovine veterinary work. It seems to me that this is scarcely possible unless he is the departmental head. I quite see the difficulties, but, whatever is done, I think it should not be possible that any bovine veterinary question should be settled (I mean any broad question of policy or such like) without the Director of Agriculture being able to make his influence felt in the fullest degree.

52,699. In animal husbandry, of course, there are two divisions: one deals with cattle and live stock improvement and the other deals with the treatment of diseases?—Yes.

52,700. Supposing you do split up animal husbandry into two such broad divisions, would you have cattle breeding under the Veterinary Department, or would you leave it under the Agricultural Department?—I have not really thought that out very carefully, but it seems to me that both would have to be under the Veterinary Department; at all events, the Veterinary Department would have to have a very intimate connection with anything to do with cattle breeding.

52,701. So that you would recommend that cattle breeding should be under the Veterinary Department?—Yes. I think that it would have to remain with them for practical purposes.

52,702. It has been suggested to us that the subordinate revenue officials should have some agricultural training; do you think it would be advantageous to give some sort of training in agriculture to the subordinate revenue officials?—I think it would; I mean, not in order that they should become agriculturists or farmers, but that they may understand the condition and position of the agriculturist. Take my own case: when I began work in India I was absolutely innocent of all ideas about agriculture or farming and such pursuits. In the first few years of my service I was mainly concerned with land revenue settlement work; it became necessary to try and learn something about agriculture and land. In those days nobody trained us; we had to do the best we could for ourselves. I think it is very desirable that a revenue officer should have some acquaintance, not necessarily practical acquaintance, with the general bearings of agriculture.

52,703. Would you recruit revenue officers from the graduates of the agricultural colleges?—One need not necessarily be restricted to them, but I think a leavening of such graduates would probably be a very good thing.

52,704. Are you quite satisfied with the existing machinery for collecting agricultural statistics?—The Land Records Department no doubt has its defects, but I think, on the whole, that the Indian land records are a monumental work; I do not think there is anything on the same scale anywhere else.

52,705. *Mr. Calvert*: In Northern India?—In Northern India, and in other Provinces too. I think that on the whole they are very efficient.

52,706. *Professor Gangulee*: Do you suggest it would be necessary to have an organisation other than the Land Records Department to utilize available data for throwing more light on rural questions in general?—I think you want something more, something in the way of an expert agency; I think the work of a trained statistician would be very useful; he would probably have to work in very close connection not only with the Director of Land Records, but also with the Director of Agriculture. I think probably he would want a small sub-department; you could put him either under agriculture or land records.

52,707. Would you have such a department in the Province or would you have one central institute where all these data collected by the revenue officials of different Provinces would be sent and then would be correlated as you suggest?—I suppose problems would really be largely local problems, but they would have their general aspect too. It might be wise to begin with a central agency and have provincial ones later on if necessary.

52,708. It is not quite clear in my mind at what stage you would recommend specialised agricultural education?—My general view is that in primary education you cannot teach anything really vocational; you ought not to do so. And I suppose that strictly applies to the middle stage too, but I think that in the upper classes of the middle stage you can get to a sort of *via media* where you do give what I have called pre-vocational training. You cannot turn out fully-trained farmers, but you generally have boys who know something about ploughing, cattle and so forth, and you might talk about such things more intimately than you would if you were talking in general terms about botanical matters; the teaching should be something approaching practical training in agriculture.

52,709. So that practical training will commence, I take it, at an ordinary middle vernacular school?—Yes, I think you might say it would commence there. If the boy really wanted to become a trained agriculturist, he would have to go further, into some form of technical institution.

52,710. That is to say, between the agricultural college and the middle vernacular school you would have to set up another stage?—That depends on what the curriculum of the college is. I suppose the two years' course in the college would probably be sufficient.

52,711. Talking of this comparison between the importance of better communications and of education, do you not think that better communications are an essential need for the progress of rural education?—Certainly. It is very difficult to say that one is more important than the other; it seems to me everything reacts on everything else. You cannot pick up a particular point of the tangle and say this or that is the essential thing. They are all acting and reacting on each other. I fully appreciate the importance of communication as being absolutely essential.

52,712. The question of rural transport and rural communications is a serious one in India?—Yes.

52,713. For instance, children sometimes cannot go to school for want of better roads?—Certainly.

52,714. On the question of irrigation, you come from the Punjab and irrigation is an important factor there: are you satisfied with the method of distribution of canal water?—I understand that since I left, the authorities have introduced modules in most places. Certainly there were complaints or distribution in former days as to the amounts of water obtained; the lower outlet cultivators complained that they did not get enough water and generally with good reason; and, of course, there were various other factors to be considered which I have indicated in my note. There certainly were complaints about distribution; but at the same time I think that the Irrigation Department, and certainly the supervising

officers, made great efforts to have things as fair and equitable as possible; whether they always succeeded or not is another question.

52,715. With regard to water lifting, do you think the existing methods are satisfactory, or can you suggest any definite improvement with regard to water lifting from wells?—The old Persian wheel is a very antiquated and very defective machine as compared with modern machinery. There is room for the introduction of modern lifts and tubes.

52,716. Do you think the Department of Agriculture in the Punjab has paid adequate attention to this question of water lift?—I do not know whether it is adequate, but it certainly has paid great attention to it, especially in the direction of putting tubes into wells; a great deal of that had been done before I left.

52,717. With regard to rural welfare generally, do you think there are efficient agencies, both official and unofficial in rural areas for carrying out a programme of rural uplift? Let us talk about official first: have you any official agency in the rural areas which can undertake to bring into effect a welfare programme which Government may draw up?—What sort of uplift do you mean: social or moral or what?

52,718. To tackle the whole question of the rural problem?—I am not sure that we have an official agency; and I am not sure that an official agency is wanted; all that an official agency can do is to create certain conditions under which progress can take place if the population are bent in that direction.

52,719. Have you any non-official agency for rural welfare work?—No, I do not know that there is a definite non-official agency. You mean a voluntary agency?

52,720. Yes?—I do not know that in the Punjab there is. Of course, there are the co-operative societies, but you can scarcely call them official agencies. The co-operative society is an unofficial agency which is doing a very great deal for uplift, and in that sense there is such an agency; but its functions, of course, are limited.

52,721. So that, in the absence of official agencies, for the time being you will have to depend on such semi-official agencies like the co-operative organisations?—Yes, I suppose so; for tangible advance in that direction.

52,722. *Mr. Calvert*: A suggestion was made that in view of the supreme importance of irrigation from all sources to Indian agriculture, the whole question of irrigation should be under one department, that is to say, the present Irrigation Department should take over wells and everything. Do you think that would lead to an improvement on the present system?—That they should take over wells in the sense of improvement, or that Government should own the wells?

52,723. That they should take over, for the purpose of investigation, enquiry and improvement on the technical side, well construction, water lifts, water pumps and well designs: that all that should be under the Irrigation Department?—I think that you would have to revolutionise the department as it stands at present; they have got sufficient work at present, I should think, for their agency, and of course it is stereotyped on more or less definite lines: distribution, revenue, assessment, construction and so forth. I fancy if you extended it in that way you would ultimately come to the position that you would have to have a sub-division of the department to deal with canal work and another section to deal with wells. I do not know that there is much to be gained by it, except, of course, that you would have a certain amount of scientific knowledge about hydraulics and so forth. The Irrigation Department is at present specialised for canals, and I think you would have to reconstruct rather radically if it is to extend its functions to non-canal irrigation.

52,724. It is a question of how far the supply of water from wells and all the questions connected therewith can be best developed in the interests

of the country at large. Would you have a separate Water Lift Department, separate from the Agricultural Department?—No, it would have to work very closely with the Agricultural Department. I should have thought it would have been better to have had water lifts and such like, as part of the Agricultural Department's sphere, though, of course, irrigation experts would have a great deal to say as to the scientific, hydraulic and other aspects of the matter.

52,725. Why should water lift and irrigation from wells come under the Agricultural Department?—You mean merely the mechanical aspect of lifting the water? The well is an essential part of agriculture; I do not quite see how you can divide it off and say that the Agricultural Department is to have nothing to say to methods of lifting well water.

52,726. Why would not you place the Irrigation Department under the Agricultural Department?—Because it is so very technical, and there are all sorts of other work which it does: I mean revenue assessments and a lot of very complicated construction work. It seems to me that the canals require a very specialised department of their own. Designing a big canal requires very much specialised knowledge.

52,727. You have mentioned in your memorandum the somewhat limited use made of *taccavi* for land improvement, such as sinking wells?—Yes.

52,728. Do you think you could stimulate the sinking of wells by placing that under a separate department, a department *ad hoc* for the promotion of irrigation from wells in all its technical aspects?—Yes, I think probably you might.

52,729. The actual irrigation from wells in the Punjab is round about 3,000,000 acres?—Yes.

52,730. And the possibilities throughout India are enormous?—Yes.

52,731. The Commission of 1900 recommend the extension to Northern India of the Bombay system of exempting land irrigated from wells from a wet assessment for all time?—Yes.

52,732. Do you think that the system in vogue in Northern India of allowing a remission for a period of years does in fact serve to deter people from sinking wells?—No, my opinion is that it does not deter them. Of course, the periods of exemption have to be worked out carefully; they must vary from one part of the Punjab to another. Before I left I took that matter up; we do differentiate between different tracts. I think that the system has to be very carefully worked, but I do not believe that the mere fact that it is only a temporary protection, and not for ever, has any deterrent effect.

52,733. Did you ever form any opinion as to why people do not sink wells when the conditions are favourable?—Probably want of enterprise, ignorance and so on: the want of the economic outlook, which is at the bottom, of course, of a great deal of the trouble.

52,734. On the question of industries supplementary to agriculture, I note that you use the term "industries"?—Yes.

52,735. Do you, there, intend to differentiate between industries in the ordinary use of that term, and occupations?—What I had in my mind was rather to differentiate industry from the actual work of cultivation, of ploughing and so on.

52,736. I think you have stated, in answer to Sir Henry Lawrence, that the market for these products would, in a vast proportion, be the home market?—I understood the question to mean products generally, agricultural and other.

52,737. Dealing with the products of these village industries supplementary to agriculture?—I anticipate that most of them would be sold in the home market, unless my idea of artistic fabrics materialised; I imagine that there would be a foreign demand for the latter.

Sir Patrick Fagan.

52,738. The Widows' Home in Lahore makes silk stockings, but there would be a limit to the demand for silk stockings in India?—Yes, but as you progress there will be new wants. One element in progress is the emergence of new wants and another is the finding of means for satisfying those wants. I am contemplating that with agricultural development new wants will arise; in my view that is progress; if you are not going to have new wants arising, you will not have progress.

52,739. You have got many millions of cultivators for whom you are trying to find subsidiary employments?—Yes, to take up their time.

52,740. Their employment will consist in doing something and receiving something in exchange?—Yes.

52,741. Can you distinguish between industries carried on with a view to exchange for other products, and efforts at self-improvement?—The primary object of the subsidiary industries, of course, would be to improve their economic condition; improvement of their economic condition would be self-improvement: the two things work together.

52,742. I was wondering whether, when you used the word "industries," you were differentiating between the manufacture of articles for sale and occupations to improve village life?—No, I do not know that I had that distinction in view; I think I had more the idea of manufacturing articles either to sell or for the domestic use of the producer.

52,743. Why should they manufacture to sell? Why not to consume?—Certainly, they can do both: they can manufacture for their own use instead of purchasing; I quite agree with that.

52,744. *Professor Gangulee*: Would you advocate selling only in cases where he can produce more than he can sell?—If he can produce something for himself which would obviate the necessity of buying it, that is part of the same thing, it seems to me.

52,745. *Sir Ganga Ram*: Could you give an example?—Textiles. I suppose if he could economically weave for himself, he would not have to buy. Probably he cannot economically weave for himself: it is cheaper for him to buy.

52,746. *Mr. Calvert*: Taking districts with which you are well acquainted, such as Hoshiarpur, about 75 per cent. of the cultivators cultivate about two and a half acres?—Yes, that is so: the actual tenant who cultivates.

52,747. Cultivating, whether as owner or tenant?—Yes.

52,748. What is the optimum you visualise for them?—It is very difficult to foresee. In my time, many used to emigrate temporarily to the Cape and other places and a large number went into the Army; income was supplemented in these ways. I did not know that the figure had fallen so low as that.

52,749. In Kangra the yield is 80 per cent., and of course in Bengal such figures are quite common?—I suppose it means more intensive agriculture, as far as that can go, and also more subsidiary industries. One cannot see much more than that; unless of course industrialisation of India, on an immense scale which does not seem possible in a measurable time, were to take these men off to factory and other labour in towns.

52,750. I think you will agree that a great deal of the improvement of the lot of Indian cultivators has been due to the provision, largely under Government auspices, of what you might call outside services such as better communications, railways, markets, irrigation and so on. Can you suggest any further similar services which Government can supply for the improvement of the lot of the villager?—I suppose transport, small feeder lines and such like, better village roads and possibly road transport services.

52,751. In one Province at least I think the rent is also fixed for the term of settlement along with the land revenue?—Yes.

52,752. Do you think a measure like that would tend to stimulate the improvement of agriculture: at the time of fixing the land revenue to

fix the rent at the same time for all tenants, occupancy as well as non-occupancy?—I think it might, possibly. Whether you can do it is another question, of course, but possibly it might. It is a question one would have to consider very carefully, especially with regard to the *batai* paying tenants.

52,753. On this question which you refer to in your note of severe economic loss having its origin in deforestation of lands, do you think Government would be justified in embarking on any considerable schemes of afforestation on those lands?—Financially?

52,754. Taking the longest view, and not considering direct return alone, but direct and indirect returns?—I think a great deal of land below the Sewaliks could certainly be improved in time if the hill torrents were properly checked. For that purpose afforestation is necessary; but I do not know that it need be anything very elaborate or scientific. I think afforestation for the purpose of checking the actual flow of water would probably be comparatively simple and of a comparatively inexpensive kind. Of course, if it were scientific afforestation with a view to subsequent exploitation, that is another matter; but I think a good deal could be done scientifically and yet cheaply for the main end in view, and that is to stop the flow of water down into the plains, so as to enable a great deal of cultivated land there which has been damaged to be recovered; in that way Government might recoup itself and probably would.

52,755. Were forests under you?—Certain aspects, chiefly concerned with forest settlements, not so much the technical part of forest work. I mean that I had nothing much to say as to reservations and technical working plans and things of that kind, but questions of forest rights, forest settlements and such like, used to come to me.

52,756. Would you be prepared to hazard an opinion as to whether Governments pay sufficient attention to the views of forest officers as to the need for protection, afforestation and conservation?—I do not think generally they pay as much attention as the forest officers would like, but, on the whole, I think they are very reasonably alive to the real demands of the Forest Department in that direction.

52,757. Popular pressure is all the other way?—Certainly; I mean that popular pressure is directed to having a minimum of restrictions and a maximum of rights and privileges; there is very little idea of the necessity for regeneration. I remember very distinctly asking people in Kangra once when I had a number of them before me: "What are your children going to do when these woods disappear?" They said: "We want our wood; the children can look after themselves." That is the general attitude of the villager who has Government forests near him. At least, it was the attitude; I daresay things are altering now to some extent in some of the comparatively enlightened parts.

52,758. You take that view, that the popular pressure is all in the way of meeting the needs of to-day without regard to the needs of future generations?—I do, certainly.

52,759. Do you think Government has paid sufficient attention to the forest view?—It has not in the past; I mean that the Indian forests were left to themselves, and it took about ten or fifteen years to get together a Forest Department. Since then, on the whole, I think that Government has been awake to the facts. One does know of very lamentable instances in the Kangra District where, certainly, Government did take a wrong view of the rights of the people; but that of course was very many years ago. I do not think that sort of thing would have happened later up to the year 1918; I do not know what the attitude of Government is now.

52,760. On the question of fragmentation, do you think any good would result from any enactment forbidding partition between sons below a certain limit?—I do not see how you are going to work it practically.

Sir Patrick Fagan.

As I said in reply to Sir Thomas Middleton, you may forbid the partition, but you cannot prevent people privately partitioning and working separately. You are not speaking of forbidding partition altogether?

52,761. That would mean partition as shown in your revenue records?—If you forbid partition altogether, it seems to me you must go further and refuse to recognise joint succession; if you recognise joint succession, it becomes very difficult to say also: "You shall not partition." If you say: "You shall not jointly succeed but only one son shall succeed," then you would meet your difficulty. But, having admitted the right of joint succession, I do not quite see how you can go so far as to say: "We are not going to allow you to partition although we have recognised your joint property." To refuse to recognise joint succession would, of course, be impossible.

52,762. *Dr. Hyder*: You were Financial Commissioner of the Punjab?—Yes, I was one of two.

52,763. I should like you to tell me what your idea is of the scientific procedure for ascertaining the average yields of different crops; what was your practice and what improvement do you suggest?—The Agricultural Department operated in certain districts; they marked down a particular field; the crop was cut at harvest time and the result weighed. A good many experiments were done by the Settlement Department in the course of settlement; fields were marked, at the harvest time they were cut and the produce weighed. The circumstances of the field, as to its manuring, the number of times it had been ploughed, irrigated and so on, were all recorded. We had a considerable number of these results, and the average of them gave some sort of idea of what an average out-turn might be; but it was always my view that we had not nearly enough of them, and we had no trained staff to deal with the matter scientifically. For instance, one never knew whether the grain weighed had been properly dried or whether it had not, and there were various difficulties of that kind. Then there were certain other districts in which, I think, the Deputy Commissioner was supposed to carry out experiments, but the whole system, I thought, was unsatisfactory. It seems to me that it is essentially expert work, and that it should be carried out mainly by the Agricultural Department.

52,764. What is your definition of standard deviation?—It is a statistical concept; you take the deviations from a certain figure, you add the squares of those, divide by the number of deviations and take the square root; that gives you the spread of the difference. You may have one set of quantities in which all are very near the average, while another set may have the same average but be very widespread, which, of course, makes a good deal of practical difference. It is my impression that the standard deviation in crop outturns would be fairly large.

52,765. Having found out your standard deviation, I want to know what use you are going to make of it in coming to this settlement rate?—If you had your average and your spread was very large, it would tend to make you very careful in assessing up to that average; you would have to remember that there were a good many weak people who did not come up to that average. If you have an average where the spread is very small, and most of your people are up to that average, then you can go nearer to it with confidence; but if you have a large spread, while it is quite true that there are a large number of people above it, it is equally true that there are a lot of people below, and if you keep close to the average there may be a good many more people in trouble than there would be in the other case.

52,766. At present, it is an ordinary arithmetical average of yields over a number of years?—Yes, it is practically.

52,767. And that applies to all manner of people?—Yes, but, of course, the assessment is not an arithmetical operation; you have to remember

that arithmetical results merely provide some sort of guide. He is a very unwise Settlement Officer who sticks to arithmetical averages too closely.

52,768. He would have to apply his common sense and see if the cultivator was strong enough to bear the burden?—Yes.

52,769. The ordinary practice is that you apply an average all round?—Yes, in order to get at the arithmetical results.

52,770. *Sir Ganga Ram*: What proportion of the gross produce of land do you take for the revenue in the Punjab?—The theoretical standard used to be what we called half the net assets; I think it worked out, as far as I remember, at something like ten per cent. of the gross produce.

52,771. There is evidence before us that in the United Provinces the Government only takes two per cent.?—It was ten per cent. on assumed prices; that figure is not reckoned at current prices; if it were, it would fluctuate with the range of prices. That ten per cent. depends on the range of prices we assumed for the whole period of settlement, which was pretty lenient compared with actual current prices.

52,772. Then you think that statement about the United Provinces is wrong?—I cannot answer for the United Provinces, but I should say two per cent. is certainly very low.

52,773. Do you know that the collection of the revenue on certain dates very shortly after the reaping of the crops forces the people, especially if they are small peasants, to sell their produce at a loss?—Of course, it makes it necessary to sell produce in order to obtain money for land revenue payment.

52,774. Or forces them to go to the moneylender?—No doubt it operates in that way in some cases, but not in all. In fixing the dates for the instalments of land revenue we always used to take that consideration into account and as far as possible meet their convenience.

52,775. Do you see any objection to giving them the full six months, making it the 1st October?—Yes, I think probably in that way a good deal of money that might quite conveniently have been devoted to paying Government revenue would be diverted to other purposes; I think that is possible if you fixed as long a period as six months. I quite admit that there ought to be a reasonable time.

52,776. *Professor Gangulee*: In view of the changing conditions, do you think the Forest Act of 1878 requires to be modified or amended?—I think it worked fairly well up to the time that I had anything to do with it.

52,777. You could not think of any definite suggestion for improvement?—I cannot think of any definite suggestion at the present time, but no doubt there are matters on which forest officers could point out where alteration would be desirable.

52,778. Is there any scope for fuel reserves, which are of course very important in a Province like the Punjab?—There is scope for them, but whether it is possible to have them is, it seems to me, another question. Fuel reserves are mainly in the plains: they would have to be irrigated; they would have to be fairly numerous, of course not one near each village, but you would have to have a good many; then you would have to have shops, and so on, for distributing the produce. I am inclined to think that, in the long run, probably the cultivator might have to pay more for his fuel than he loses by using his cowdung; but it is very difficult to calculate. I do not think the fuel and fodder reserves in the plains are possible on any really big scale.

The Chairman: I do not think Sir Ganga Ram correctly understood your last answer to him.

52,779. *Sir Ganga Ram*: Did I not correctly understand your last answer to be that it would be advantageous to allow the people six months to pay the revenue?—I think six months is too long; on the whole I do not think it is necessary.

Sir Patrick Fagan.

52,780. Is it not collected earlier merely for the purpose of showing the revenue in that year's Budget?—I do not think so; I think that the Government wants the money.

52,781. It is in order to frame the Budget, is it not?—No, they want it for actual ways and means.

52,782. *Mr. Calvert*: On page 56 of your note, you say that under the *killabandi* operations it was required that all the cultivated fields of that village should be rearranged and consolidated in rectanguar plots of suitable area?—The main point was that they were to be rectangular.

52,783. That had nothing to do with consolidation?—No, it had nothing directly to do with consolidation of holdings.

(*The witness withdrew.*)

Sir DANIEL HALL, K.C.B., M.A., F.R.S., Ministry of Agriculture.

NOTE.

It is with very considerable diffidence that I submit any statement to the Royal Commission. I cannot claim a knowledge either of Indian agriculture or of the organisation of research and education already existing in India. I have in consequence confined my statement to a discussion of the question of research; even so it is more than possible that many of my suggestions have already been considered by the Commission, perhaps *ad nauseam*.

It is of course well known to us in England that there have been extensive developments of agricultural research and education in India during the last 20 years, resulting in the formation of a distinguished corps of scientific workers. In the nature of things, these men have been almost wholly occupied with problems close to their hand which have pressed for immediate solution.

There would, however, appear still to be an opportunity, indeed a need, for a wider survey that would consider Indian agriculture as a whole in relation to the economic necessities of its population, which would look for some of the deeper rooted causes and envisage long range investigations. By this survey some general direction might be given to the stream of investigation. It may be that in this conception there is a danger of exaggerating our powers of organisation and of over-estimating the effects that can be obtained even by Government. In attempting to give a direction to the agriculture of a country like India we are assuming not merely that we can obtain a greater control over nature but also that we can alter the habits of a congeries of peoples, steeped in a well tried tradition, with the risk of famine attendant on any failure of method. Even in the immediate field of agricultural research it is possible to over-organise and to put too high a value upon direction of effort and team work. The wisest act of the administration may be to provide opportunities for work and then to trust to the chances of discovery and the flowering of genius.

None the less, in dealing with a body of workers it is desirable to arrive at some general statement of policy and discussion of the ultimate needs of the agriculture of the country. Genius will look after itself but Governments have to work with more ordinary tools, by which results with far-reaching consequences can be achieved if the right kind of stimulus and direction is supplied. The danger of all organisations for research is to become engrossed in problems of technical interest alone, to continue to elaborate methods without considering their application, to forget the end

in the means, and it is in this respect that some direction, some outside stimulus and criticism, becomes of importance.

To this end I think there should be, in India, a Council of Agricultural Research. The Council should be predominatingly scientific but with some lay and administrative members to keep it informed of the reactions of the measures proposed on the agricultural community.

The function of the Council would, in the main, be the constructive one of reviewing the situation and thinking out schemes of investigation but it would also have some administrative functions in developing the machinery of research and in considering the requirements of work in progress. It is desirable that the Council should have some funds at its disposal over a period of years, and presumably it would proceed and derive its powers by being able to make grants-in-aid to institutions and individuals otherwise financed by the Provincial Governments. The Council must also be able to engage men to make enquiries and conduct investigations required for the framing of schemes of research, but otherwise would not conduct research nor work other than through the Provincial Governments. The first business of the Council would be to endeavour to frame a research policy for Indian agriculture. What are the problems? Some are immediate and technical, e.g., the question of soil conservation and improvement, with the supply and use of fertilisers, or the improvement of crops and stock. Some are economic, such as methods of marketing, the choice of production for home consumption or distant markets, the choice between fuel or fertiliser. But, overshadowing all others, is the problem presented in general by Indian agriculture—that a proportion of the community amounting to perhaps three-fifths is engaged in producing the food consumed by the community only. It is probable that one-fifth or even one-tenth of the total workers could, on the same land, with properly organised methods, produce the amount of food required by the whole. I do not assume that the latter condition is either practicable or desirable, but the question is fundamental whether the goal is to be organised efficient production or the peasant community that is barely more than self-sufficient. I recognise the futility of anyone, as unfamiliar as I am with the administration of India, attempting to outline a constitution and a procedure, but in no other way can I make plain the manner in which I conceive the Council can operate. That which follows I would ask, then, to be regarded as suggestive rather than a definite scheme.

The Research Council would consist of:—

(1) A Chairman of high administrative standing.

(2) Eight men of science, the majority of whom should not be technically concerned with agriculture but should be chosen for their width of view and imagination.

(3) Two economists.

(4) Three lay members interested in agriculture.

The secretary should be possessed of some scientific and technical knowledge. The Council would begin by issuing a questionnaire, inviting not only specific proposals for investigation but also more general considerations of the larger problems that could be dealt with by research. The secretariat would reduce the answers to some sort of form and issue the record to members before the meeting.

The plenary meeting of the Council would require the undivided attention of members for something like a week. With the distances involved in India, it would be impossible to expect meetings of the whole Council at short intervals, it would be preferable to aim at an annual meeting only, but of

such duration as would permit of ample deliberation. The Council would then:—

(*a*) make a preliminary survey and selection of the fundamental problems for more detailed consideration.

(*b*) consider the machinery to be adopted for the development of research:—special institutes, relations with the agricultural colleges, universities and individuals.

(*c*) constitute specialist committees with co-opted members to which might be remitted for report the specific proposals which had been submitted.

Both (*a*) and (*b*) would involve a good deal of enquiry before the Council could be in a position to make definite recommendations.

As regards (*c*) some kind of standing organisation could be devised for dealing with urgent cases, but in subsequent years the Council would have put before them the proposals accompanied by the reports of the specialist Committees.

Oral Evidence.

52,784. *The Chairman*: Sir Daniel Hall, you are the Chief Scientific Adviser to the Ministry of Agriculture, and you were from 1902 to 1912 Director of the Rothamsted Experimental Station. I think you are now Commissioner under the Development Act?—No; I was from 1912 to 1917, when I went to the Ministry. I am not even at the Ministry now. I am back again as a Director of the John Innes Horticultural Institute at Merton.

52,785. We have your note of evidence. Would you like to say anything in addition to it at this stage?—No. As I thought I explained at the outset, not knowing quite about what the Commission wanted me to deal with, I could only put in a very general memorandum on the broadest aspect of research as applied to the problems of Indian agriculture as it appeared to a man at a distance, who knew nothing about India at first hand, but who had only some general knowledge of the Agricultural Service there and the work that that Service was doing.

52,786. I will put to you, if I may, one or two questions of a general nature first. What do you say as to the value of associating research with teaching?—The two are complementary to one another and cannot profitably be dissociated. Any teacher worth his salt wants to be doing some research, and he keeps himself alive by doing some research Any research station which is divorced from teaching organisations is labouring under a difficulty in not getting at the young men who are going to have the future in their hands. It was a difficulty that we experienced at Rothamsted, that we were a pure research station and that we were not part of any University, and that we had no flow of the younger people through us. Of course, various means were adopted to get over that. It is just the same difficulty which I feel in my present position as head of the John Innes Horticultural Research Institution. Again, we have no teaching functions, and in consequence no necessary flow of the younger people coming to us. We have a certain number of volunteer research workers, and one of the things that I am endeavouring to do is to secure this particular contact. But without doubt a research station ought to be closely associated with the University. You may notice that in the research scheme which has been worked out by the Development Commission and the Ministry of Agriculture, with the exception I think of Rothamsted and of the special research station which was founded for fruit in Kent, all the institutes have been associated with a University. They are independent in the sense that they are self-contained inside the University, but they are there so that they may be in contact with the other workers in pure science and with the young men who are pursuing their studies.

52,787. Does the exception include all the research stations directly under the Ministry?—I think I am correct in saying that only Rothamsted and the fruit station at East Malling are the institutes which are by themselves in the country and which are not directly linked to a University.

52,788. *Professor Gangulee*: But a student can do work at Rothamsted and obtain a degree in the University of London?—That is so under the new arrangement, but none the less, there is no automatic contact.

52,789. *The Chairman*: How far is it possible for a research worker to teach? Has he the time?—If he is not too crushed under the routine teaching he ought to have time. There ought to be such a provision in his conditions of employment that he has time to give himself up to research: and as a rule, a man who wants to do research will find time if he has got the opportunity. It is quite easy so to organise that, a little, within most institutions. When I was Principal at the College at Wye I made it part of my business to see that every man who was there had at least one day in the week absolutely free from all teaching engagements, so that he could put the whole of his time into any investigation work he wanted.

52,790. About how many hours a week were your research workers teaching?—If you are considering a research worker, I should say that if he is there as a research worker and not as a Professsor, he ought not to do more than three hours a week teaching at the outside. That may involve more preparation, but I would put three hours lecturing as a kind of limit. That is the sort of limit we apply in the Ministry to the men on the advisory staff. We attach to the agricultural colleges men whom we call Advisers—entomologists, mycologists, chemists, economists, and so forth, whose function is to advise the local farmer, and to conduct local investigations. We can say: "You can do a certain amount of teaching. It will not do any harm; it will do the College good, but our limit is something of the order of two or three hours a week."

52,791. Why has it been found necessary to have research stations under the Ministry itself? Why could not the work have been carried on at those stations by other institutions not directly under the Ministry?—I think the only answer to that is that it was not being done. The Universities, who are the fountains of learning, had neglected agriculture, and would probably have continued to neglect agriculture unless some direct stimulus had been given to them. Going back to 1890, which was about the date at which all the movement towards agricultural education and research began in this country, at that time there was a Professorship at Edinburgh, a Lectureship at Aberdeen, and a kind of occasional lecture course or Professorship at Oxford. In the Universities there was no agency whatever for getting knowledge or giving instruction in connection with agriculture.

52,792. *Professor Gangulee*: What was the direct stimulus to which you refer?—The stimulus then? The stimulus was a monetary one. The stimulus arrived in the shape of a certain amount of money that was rendered available for the purposes of technical education, and was handed over to the local authorities. Many of these local authorities, being dominantly agricultural, conceived the idea that they would have some agricultural instruction, and the result was that from 1890 or 1892, for another fifteen or sixteen years, there were attempts to build up agricultural colleges and centres of instruction. Some of the men at these colleges carried on research, and got up such a feeling for research that eventually the Development Act provided money for research.

52,793. *The Chairman*: You have had considerable experience of the Development Fund and of the Development Commission, both as a member of that body and also, I suppose, as one responsible for submitting schemes to be financed by the Fund. What do you say about the principle involved in the Development Commission. Do you like it?—The Development Commission was to a certain extent an *ad hoc* expedient at the time. It

represented the necessity of creating a new body to start up certain lines of policy, which had no precedent in English public life at the time. I am not quite sure, if one were to re-cast the situation anew to-day, that one would set up the Development Commission quite on its present lines.

52,794. Can you tell this Commission what changes you have in view?—The question of agricultural research, for instance, has become larger and, in a sense, much more technical than it was at the time of the creation of the Development Commission. Therefore, if one were setting up a new body to take charge of this sort of thing, I think it would be a body that would be more definitely scientific. I am not sure that it should be a body possessed of funds other than funds necessary for getting information in order to enlighten itself, as it were, sending out experts to make enquiries. I think any body of that kind does require to spend money in order to inform itself, but I am not at all sure, at any rate in a Government like our own, that one ought to interfere with the direct function of the Treasury in providing the department with the funds which it requires for its purposes. Therefore, I would not say that any body of the kind ought to finance the whole of the work which requires to be done. It should be advisory, and at the outset perhaps it should only be able to make grants-in-aid in order to stimulate the appropriate body to set about the work.

52,795. Do you suggest that this fund should be non-lapsing?—Certainly.

52,796. Because of the importance of securing continuity in research?—Continuity in the work, and the importance of not having to live up to your income in any particular year. You cannot say in any particular year that you are going to get enough to do to justify the expenditure of your whole income. In another year you may want to run a good deal beyond it.

52,797. Is there, in fact, much difference between the arrangements which you have just outlined and those existing to-day? For instance, you talk of a non-official institution applying for funds. The submission is put up by the Ministry of Agriculture, and approved by the Commission. The Treasury still has to give its final approval, has it not?—Yes. The legal position of the Development Commission is, as it were, that of an advisory committee to the Treasury.

52,798. Therefore Treasury control is always present?—Yes.

52,799. It is not a matter of a body of men having, at their disposal, a fund which they can distribute without leave from the Treasury or any Minister or anybody else?—When the Development Commission was started it had a sum of money. While it could not dispose of it without the consent of the Treasury, the money could not be spent elsewhere.

52,800. That was to try to prevent raids on the funds?—Exactly.

52,801. Are raids on funds any less popular to-day than they were when the Devolpment Fund was set up?—I think funds are less popular.

52,802. Are you familiar with Indian conditions?—Not at all.

52,803. You probably do come into contact with a certain number of Indian students who come to this country?—I have come in contact with Indian students, and I have come in contact with English members of the agricultural staff. There are a good many men who have been pupils of mine, or who have worked with me, and so on. I know, in that way, something of the methods of work in the organisation of the Agricultural Service.

52,804. Have you formed any view as to whether there has been of recent years an improvement, or the reverse, in the training and qualifications of Indian students whom you have seen in this country?—I do not think I have a wide enough experience for my opinion to be worth anything on that point.

52,805. Have you formed any opinion yourself as to whether it is best that Indian scientific workers should be trained altogether in India, or

that they should come to this country, or some other country, European or American, at any rate, for the final stages of their training?—I think any serious research student ought, at some period in his training, to get outside his own country. He ought to experience a different atmosphere and, in the case of agriculture, see for himself an entirely different type of agriculture. It may not be that he is going to take any direct lessons from it, but he wants to know it exists and see that it is real. All research workers ought to come in contact with some outside scientific influences.

52,806. That applies just as much to British research workers as it does to Indian?—Exactly. In our research scholarships that we give (we give some six or eight every year) it is one of the conditions that some portion of the time is spent abroad.

52,807. At what stage in a man's career do you think it best for him to go abroad?—Very late.

52,808. As late as possible?—After his initiation into the methods of research, I should say. He wants to be familiar with his tools before he goes to the man who is going to start him on an investigation of his own. I would say even that very often the most fruitful time for the young research worker to go abroad is after he has had a few years' work in his research station, a kind of super-student course. You never know about a man whom you take in a research station. He may have been of good promise as a student and has shown every sign of becoming a research worker. You put him down to problems, and you have him for four or five years, and then you find that he is unsuitable. He is temperamentally or imaginatively unsuited to carry on research work. Then he is best persuaded to take up some other line in life, to go back into teaching or to go into business. When you have found the right man, and he has had four or five or perhaps six years in your home research station, if you then can give him a year abroad to come in contact with, perhaps, a master of his particular subject, I think you have done the best possible for him. It will make a lot of difference to his future quality.

52,809. Going to rather a different subject, can you tell us whether you think appointments in India, of a scientific nature, are likely to attract European research workers in the future, and particularly whether you think the five or ten years' appointment, with, of course, an appropriate salary, is likely in the future to be attractive to European research workers?—It is a somewhat difficult question to answer in that one does not quite know how rapidly the situation is changing. There was a prejudice a year or two ago, a very strong feeling, in the Universities and amongst the young men in the research stations, against going out to India. Certain cases were quoted of men who had been, as it were, returned, their engagements broken or otherwise, and this created a feeling that the tenure was unsafe. A man in academic work goes abroad always with certain qualms that he will be forgotten, unless he is a man of outstanding quality. A young man who has qualified at home here and has done two or three years' work would, I think, rather fight shy of a five years' appointment. He may say "A five years' appointment may be good or bad, but who will know anything about me at the end of those five years? I shall have been working in surroundings which do not get talked about at home. The odds are that I shall not have accomplished any big piece of work which will advertise me. I shall have lost touch with all my friends." This is his danger, and it is a very real danger. One sees it over and over again in a young man in whom one is interested who has gone abroad. It is not peculiar to India. It is just the same as going to one of the African Colonies. The man who leaves home for a short-period appointment does get forgotten, and the ordinary run of appointers in this country, County Councils, colleges and so forth, say

"This man has had no experience at home. His experience has been a foreign one. He knows nothing about our kind of work, and we will pass him over." Unless he has got some very good friends who believe in him and who will back him, he finds a little difficulty in stepping back into the English academic world. It is not in any way peculiar to India.

52,810. Do you foresee a substantial increase in the demand for young research workers in the Colonies, Mandated Territories, and so forth?—Yes, there is a very striking increase going on at the present time.

52,811. Is that, so to speak, likely to affect the market for such workers, and to make it more difficult to attract the best quality to India?—It is. The market is a short one at the present time. In certain directions, particularly, it is very difficult to find young men.

52,812. And I gather there are schemes on the horizon which will, if they mature, substantially increase the demand?—That is so.

52,813. *Professor Gangulee*: I want to get from you, very briefly, your idea of an ideal structure of a system of agricultural research. You suggest in your note of evidence that there should be, in India, a Council of Agricultural Research. How does that suggestion of yours compare with the Council which I understand is in existence in England and Wales?—We have no Council here at the present time. The question of whether there shall be a Council or not is one which is being seriously discussed by a Civil Research Committee at the present time. There is a difference in the circumstances. We are pretty close together here in England. The co-ordinating action of the Development Commission has been quite sufficient, up to the present time, to procure the proper contacts and some sort of a review of the situation as a whole. My suggestion of a Council which appears in my note of evidence is more directed to the fact that India is very vast. It is a continent and not a country like this. The conditions are very diverse in India. I understand that even the Agricultural Services are independent in the different Provinces. Yet research (research from the long range point of view) must envisage the whole, and not merely a part.

52,814. You agree with me, do you, that the development of agriculture in a continent like India involves a host of common problems?—Yes.

52,815. How would you approach those common problems? Through what organisations would you approach them? To which organisation would you refer those common problems?—Do you mean to do the work?

52,816. To do the work in some instances, but to direct and co-ordinate the work of the country generally?—I would make a distinction between direction and doing the work. I would do the work in, or through, the Universities, and through the Agricultural Colleges if such existed. I am speaking again with a certain amount of want of knowledge, but I always regard the Universities as the agencies which ought to carry on the work. The direction, of course, has got to be much more centralised.

52,817. There would be a need of a central driving power in a sub-continent like India?—A central suggestive and driving force, in the sense that it will provide finance.

52,818. With regard to the United Kingdom, I think Scotland is separate from the agricultural administration of both England and Wales?—Yes.

52,819. And Ireland, too, has a different department?—Ireland has two departments.

52,820. Do you think such a step of dispersion of agricultural administration has lessened the influence of the agricultural interest in the Cabinet?—Yes and no. I think if one started with a clean sheet, if there was an United Kingdom (which there is not) there would be only room for one Department of Agriculture; and I would say again that there is really only room for one Agricultural Department in Great Britain. All problems are common. The present arrangement is a kind of compromise between principles of

nationalism and the principle of getting the work done most efficiently; but as regards research, we have more or less a common policy, thanks to the fact that the Development Commission exists independent of boundaries, and can frame a scheme for research which takes no account of nationalism.

52,821. So that the Development Commission assisted in the formation of a common research policy?—Yes. If the Development Commission did not exist, something would have to be created; some liaison between my Ministry and the Board of Agriculture for Scotland. You cannot attack research problems with national boundaries.

52,822. Referring back once more to the ideal structure of a system of agricultural research, for all fundamental questions you would organise a central co-ordinating body. You would tackle the common and fundamental research problems through such a body more advantageously than if you allowed those problems to be dispersed without direction?—The act of your central administration might be to disperse it. The act of the central thinking body might often be to say, "Well, now, at 'A' you will do that part of the work; at 'B' you will take charge of something which bears on it, and at 'C' you will do something else." I do not ever conceive of a central administration as a central body to do the work.

52,823. The thing I have in mind is this: For instance, we know definitely that soil work is being done at Rothamsted, or at any rate some aspects of soil work are being done at Rothamsted, and another aspect of it is being carried on at Aberystwyth. Would you require some central organisation to suggest what part of the work should be done at Rothamsted?—A central organisation can insist, first of all, upon a certain delimitation of the field, and that there shall not be unnecessary overlapping (although overlapping is rarely to be dreaded in practice), and it can see that neglected aspects of the subject are attended to.

52,824. Those are the two functions: first that the central organisation may see that the neglected aspects of agricultural research are attended to, and secondly, when a new problem arises to see that the problem is tackled under the most suitable conditions by different stations?—Exactly, and to ensure, of course, that the method of attack goes far enough. My experience in connection with the Development Commission in the Ministry is that one of the great functions which you have to perform is to restrain a number of people from jumping in on a problem which far transcends the resources of an individual. These individuals feel the need of doing work in that direction, but they do not realise what an enormous task it is. If Rothamsted had not been set up as a kind of central soil research station, but all the agricultural colleges, more or less, had been allowed to go as they pleased in matters of research, we should have had, without doubt, perhaps twenty individual men working on some soil problems, never being able to penetrate very far because they were individuals and had not got the complex team, or the power and strength behind them, which is necessary nowadays to deal with many of these research problems.

52,825. Therefore, first of all, for the formulation of a research policy, and, secondly, for the continuation of that research policy, you need a central organisation?—I think you need a central thinking and more or less controlling body.

52,826. Now, let us come to the composition of that central body. Would you have the central body purely advisory?—As I think I have indicated in my memorandum, I believe if it is purely advisory and it has no funds whatever, it is apt to lack weight for its decisions. I think it is taken much more seriously by its members if it has some funds to administer. On the other hand, I do not think it ought to attempt to replace the business of Government mainly to finance work of this description. If it is able to give grants-in-aid it is able to stimulate very much.

Sir Daniel Hall.

52,827. You would divest it of any administrative function?—Yes. Do not let it administer more than is necessary for its own purpose of gaining information.

52,828. Would you have this particular central organisation as large as you have suggested in your note of evidence with respect to the Research Council? You suggest a Research Council of 14 members. Would you have a smaller body than that or would you have a similar body?—The object of getting it as large as that is to get, out of 14 or 15 men, one or two who mattered.

52,829. Would not you suggest a smaller body than the one you suggest here, assisted by a Council of Agricultural Research?—You want rather a diversity. Agricultural science, if you may speak of such a thing, or the sciences connected with agriculture, are very diverse. Then you do want some lay minds: I believe in bringing in the lay mind to a certain extent, even if it is only for the purpose of keeping the scientific man away from the point of view that there is "nothing like leather," and also to give him some sense of the practical consequence. Again, I attach importance to the bringing in of the economist. I draw the distinction between economists and scientific men, though really I regard them as the same people.

52,830. If you agree that the object of a central organisation is to direct and stimulate research, to formulate research policy, and so on, and to view the agricultural problem as a whole, do you suggest that this Council, consisting of 14 or 15 members, should be full-time workers or voluntary workers? Will they be paid or unpaid workers?—I only adumbrate them meeting. I think if they are to be efficient they would have to have some other job; they would have to be engaged in work of one kind or another. They should not be withdrawn from their normal course of life in order to do this particular job. This is an extra, as it were. I thought of them rather as having a meeting once a year, in the case of so wide and large a country as India, but of giving up then rather a considerable amount of time, and, in the interim, perhaps as individuals or perhaps as Chairmen of some specialist Sub-Committees, continuing in contact with certain branches of the work.

52,831. Would not you agree that for the permanence and for the continuation of the work, it would be better to have a smaller body which would be assisted by this Council of Agricultural Research? Would not that bring you into touch with the lay mind as you propose?—I should call that a secretariat. I should make a rather strong secretariat. I would be quite content to have a first-rate Chairman who was perhaps able to devote the whole or the greater part of his time to the work, and then to have a strong secretariat, with this Council to consult specialist jobs.

52,832. You have, as I understand, an elaborate arrangement of repeating experiments in different parts of the country. In Rothamsted, or in some other central station, you carry out certain fundamental research. In order to test the result in different parts of the country, I understand that you have certain arrangements. I should like you to give us some information of what arrangements you make with your county organisations?—You mean how we spread a result which is obtained?

52,833. How do you test a specific result, obtained in a central station, throughout the country? For instance, you find that a certain variety of potatoes are immune from wart disease, and you want to find out whether it maintains that immunity in Lincolnshire or in any other part of England?—I might say that we are perhaps embarrassed by the history of the growth of our educational system. When the work leaves the research group, the promulgation of it is a matter for the educational service. The educational service in this country is not directly in the service of the Ministry. They are the servants of the local authority, however much they are stimulated by us, and to a large extent paid by us.

Therefore, when we want work of that description done we have, as it were, to persuade or to suggest to the men in charge of the work that they shall get something of the kind done. Let me take a case in point. We have had for some years past, at the Ministry, a campaign for the improvement of grass land, based upon the work of some of the research stations. To that end we provide certain central funds for organisation. We draft, in consultation, a scheme of experiment, we push this scheme of experiment to the County Organisers, and we arrange for a common survey of the whole to gather up the results; but we cannot dictate to the County Organiser in Northumberland, for instance, that he must have so many experimental plots. We can only persuade him. However, we find no particular difficulty in getting the work done. We do make a clear distinction between the educational and propaganda side of the work, and the research side. It is not the function of the research station to carry the work beyond " These are certain results; now you can use them."

52,834. Will you tell the Commission something about your *ad hoc* committees which you have under the Ministry, like the Basic Slag Committee, the Committee on Electro-culture, and so on?—They are committees which are set up, as occasion arises, to deal with some particular problem. With regard to the Basic Slag Committee which you have mentioned, we were faced by the fact, when that Committee was set up, that basic slag of the character that had become a standard fertiliser and of the value of which farmers were very well informed, was becoming scarce, it was no longer being manufactured. Therefore we wanted to know something about the chances of improving the supply of material of that description. It is primarily a question for the steel-maker. After all, basic slag is only a by-product in the manufacture of steel.

52,835. Is this Committee a permanent one, working under the Ministry? —It is permanent in the sense that it has not been discharged. It is not yet prepared to make a final report and to say that its work is done.

52,836. Is not there a Committee on Electro-culture also?—We have an Electro-cultural Committee, which is directing experiments on the effects of electricity upon crops. That Committee's report hitherto has always been " Well, we have arrived at certain conclusions, but they are by no means the end of the story. Please let us go on for another year and give us some more money," and we have agreed. After all, these committees are regarded as being charged with the solving of a particular problem, and that sooner or later they will say, " Here is the answer and there is an end of us."

52,837. Are they financed by the Ministry?—Yes, in this case either by the Ministry or by the Development Commission. The Electro-culture Committee is financed by the Development Commission, on our application. We have another example. We have a Foot-and-Mouth Disease Investigation Committee. That is a Departmental Committee appointed by the Ministry. The membership of the Committee is largely that of medical pathologists, human pathologists and human medicine, appointed in consultation with the Medical Research Committee. That is financed directly by the Ministry.

52,838. Are many of these *ad hoc* committees financed by the Development Commission?—All the money which is obtained for the purpose of research has been put into the Development Fund as a matter of course. The history of that is this: When the original Development Fund was exhausted and when a new programme had to be adopted after the War, the Cabinet of the day made certain promises of money to enable the Ministry to develop its schemes. That sum of money so obtained was put into the Development Commission. When the farmers of Great Britain were promised £1,000,000 for the purposes of research and education, as some sort of solatium for the discontinuance of the Agricultural Act, that sum was put into the Development Commission, or at least our part of it was.

52,839. *Mr. Calvert*: In your book on "Agriculture After the War" you threw out the suggestion that the time had come to start an economic farm in order to demonstrate the economic aspect of agriculture. Has any progress been made with that idea?—Yes and no. Various attempts of the kind have been made; that is to say, since the War two or three experimental commercial farms have been started in order to test out certain methods. The result has been, in the main, disastrous. They were started on the wrong basis in many cases. For example, certain small arable dairy farms were started and, after five years' running, were stopped and, in a sense, written off as failures. There, I think, the initial theory upon which they were started was wrong, and we demonstrated, as it were, by trial, that it was wrong and that the idea was mistaken. One or two other experiments of that kind have been made, but with no great success. Our final opinion on the matter is that, however necessary (and a lot of these experiments are necessary) these *quasi* commercial undertakings are, you should not entrust them to a Government Department to carry out. If you do, you sow certain seeds of ill-success which may wreck the enterprise without testing the question properly. Therefore, while we still retain the idea of these commercial experiments, the management of them has been entrusted to some outside body (in our case the Institute for Agricultural Economics at Oxford) as being free from the limitations which attach to any enterprise directly managed by a Government department. Those limitations are enormously and extraordinarily hampering. We have had the same experience in connection with attempts to grow tobacco and to develop the flax industry and the hemp industry. A department is not organised for business, and I would never countenance any direct action of that kind if there was another way of doing it.

52,840. We have to make out a case for the provision of funds for research in India and, as you know, funds for research have to be voted by the Legislature. The question always arises as to how far the research is reflected in the actual practice of the individual farmer. Taking Arthur Young's tours through England, which were written before he had worked out for himself an office in the new Ministry of Agriculture, and a tour to-day, would you be prepared to say that the results of the investigations in England since Rothamsted was founded are reflected in the practice of the average farmer?—Yes, certainly.

52,841. The actual putting of more profit per acre into his pocket?—I would not say that at all, because the question of profit per acre is one which is quite independent of the farmer. It is a question of the economic environment in which he finds himself. I daresay the 18th century farmer, the value of money, and so forth, being taken into account, was a good deal better off than the farmer of to-day is. I do not know, but I can quote my own experience of farms which are very much better farmed to-day, but where the farmer is getting less profit. I can recall also the other aspect where the farm is less well farmed to-day and where, perhaps, the profits have not altered very much. The question is what is your definition of "good farming"? What is your criterion? Is the criterion profit or production?

52,842. Profit for the actual farmer, irrespective of gross production?—Then I can point you out where, within the last 20 or 30 years, from the point of view of what a farmer would call good farming, the land is dirtier, the production is less, the number of men employed is less, and so forth, but where the proprietor continues to live. I do not know whether he is making more or less money, but the only condition of making money at all is that he should let down the production. He cannot afford, as prices run, to spend as much.

52,843. In your suggested Council to control research, what element would you introduce to ensure that research was being guided by the actual difficulties of the farmer and not merely by the intellectual interest

of scientific workers?—That is a real problem. As soon as you get a big organisation of research, research institutes, and so forth, you create a kind of technical atmosphere, and you have this particular danger (which I think I mentioned in my note of evidence) of the research worker burying himself in his own world and, as it were, occupying himself in pursuing a certain factor one place of decimals further than somebody else in Russia or in America has done. There are two ways out of that. One way is to make very certain that your research worker gets rubbed up against the farmer and gets in contact with the land, which is the business of the Director of the research station; the second is that a directing body of some kind should rather rudely stir these men up and say, "You are turning machinery idly, and you really must get after something that matters."

52,844. There is that danger of the research worker being misled by factors other than the general benefit of the farmer, is there not?—That must be so. You might say, again, that there is an element of waste about research work, but it is inevitable. First of all, you must not hunt a research worker too much and urge him to direct himself to economic problems. The layman may not appreciate the importance of some of these highly technical points. After all, part of the business of a research station is to make tools and sharpen them for other people to cut with. The making of the tool may seem rather ridiculous to the farmer. If you are engaged in investigations of soil, you are certainly embarking upon most complex problems which seem to have no bearing whatever upon practical agriculture, but they are part of the equipment. The knowledge thus gained does enable the men who have got to deal directly with the farmer to give sounder advice. You have to be tender with the research worker and let him follow his own bent to a certain extent. By all means try to keep him in touch with the real thing, but also be prepared to accept a certain amount of waste rather than try to direct him all the time.

52,845. At the same time he must keep his nose along the economic road?—Point him out the economic road now and then. I would not say keep his nose along it.

52,846. *Sir Thomas Middleton*: In reply to one of the Chairman's questions, you referred to institutions being directly under the Ministry. I think there was perhaps a misunderstanding of your reply in that case. The only research institution which is directly under the Ministry in the ordinary sense is the Veterinary Institution?—That is so. I think I said that we place our research institutions with Universities. The research workers are not Civil Servants, and the direction of the research station rests with some committee of the University, as a rule.

52,847. You also used the expression that one could not dictate to the staff of a local education authority; but, in fact, you never dictate to the staff of any of these institutions in the ordinary sense?—No. You can perhaps exercise a little more pressure upon some than upon others. It is very much a matter of goodwill, and we are on very good terms with the Agricultural Organisers. We have meetings with them at times in order to get them t. take up a new line of work.

52,848. Most members of this Commission are not familiar with the terms we use in Britain, such as "Agricultural Organiser" and so on. Can you very briefly sketch the relationship between the Research Institute, the Advisory system and the Local Education system?—The research work in bulk is done by specialist research institutes: Rothamsted for soil, an Institute at Cambridge for animal nutrition, and another for plant breeding; an Institute at Reading for dairying, and so forth. They are conducting the actual investigation, and they go no further. They are alongside educational institutions, but not in them. For the educational side of the work we first of all divide the country into provinces, groups of counties,

in most of which there is an agricultural college. There is a single agricultural college which deals with the whole of Yorkshire. There is one agricultural college, again, which covers the counties of Kent, Surrey and the two Sussexes, and so on. These colleges are, of course, primarily intended to teach the students who come to them, but they also have a certain mission of bringing intelligence to their areas. To that end, it is recognised that they may be consulted by farmers within their areas. Further, we attach to them a special service of what we call Advisers. We give each of these colleges the services of a Mycologist, of an Entomologist, of a Chemist and of an Economist, and in some cases also of a Veterinary Adviser; but these men only do the minimum of teaching; they spend their time circulating in the area, carrying out local investigations, reporting in many cases to the research centre in their particular subject, or to the Ministry where the Ministry is interested in the subject, and so on. Independent of the provincial area, the counties who make up the provinces each have an organisation of their own. The County Council who is the local authority for education is asked by us to appoint a man whom we call an Agricultural Organiser. We say to the authority that if it will appoint such an Agricultural Adviser we will pay four-fifths of his salary. He is the man who has to organise the direct contact with the farmer by means of lectures, advice on the spot, discussion societies, gatherings of farmers to discuss certain points, experimental plots about the area, and so forth. These County Organisers come together two or three times a year at the provincial college centre and try to arrive at a common programme and a common method of attack over the whole area. Actually they are autonomous. They can snap their fingers at the college. They cannot do so at the Ministry because they derive so much of their funds from us. The scheme has to be worked, to a certain extent, by goodwill rather than by actual control. The Entomologist who is at the college may be advising about a disease attack in a county area where, perhaps, there is an organiser who feels that he is competent to advise about it. But that can be got over by a little common sense and goodwill. There were jealousies at first, but they have now been got over. You have to guard against contradictory advice, and things of that kind. We have known cases where a farmer, wanting advice, wrote simultaneously to the County Organiser, to the provincial college, and to the Ministry direct, and then put the three replies together in order to see if he could catch one or the other out. You have to be a little careful in those things; but, in theory, we suppose that the County Organiser will always deal directly with the farmer, and that when he is in difficulty he will call upon the Provincial Adviser or the research station.

52,849. In suggesting a Research Council for India, had you in mind the type of Council which the Department of Scientific and Industrial Research had in this country, or the type of Research Council which the Ministry has?—I had in mind the Department's Council. I do not mean a Council of actual workers.

52,850. The difficulty that arises is that in India it would be very difficult indeed to get the men who would constitute such a Council outside the Agricultural Departments?—What I was supposing was that, while you would have to have some of the men out of the actual departments (you would, very largely), you would presumably invite a man like Professor Forster, who is a pure chemist, and certain kindred men.

52,851. There are just a few of those men, but the field of selection is very limited indeed. Up to the present the Universities have given almost no attention to agricultural science, so that we could not draw upon the Universities in the same manner as you can in this country?—You would certainly have to draw in some of the men from the direct Agricultural Service, but I do want them largely leavened with parallel workers in pure science. One of the benefits of a Council of this kind would be that it would

help to break down the watertight compartments which exist in science. It is deplorable the way the pure chemist ignores the existence of agriculture. You want to rope in the pure chemist on a Council of this kind in order to make him think that agriculture matters.

52,852. The first object of the Council would be educative?—Everything has its actions and reactions.

52,853. You yourself do not expect to find more than two or three active people amongst a dozen?—Is not that the experience of all Committees?

52,854. One of the great difficulties we are up against in India is providing training for such workers as teachers, investigators, and the type of man you have been describing as the Agricultural Organiser, who, in India, is more or less what would be known as a Deputy Director. The usual plan is to adopt what you call the super-student course. Departments take on a man directly he has left the college, test him for a few years, and if he is a promising person they send him to some other country for a course of training, but this method of getting better education applies necessarily to a very small number because of the expense. They have not got, so far as I can discover, a scholarship scheme, which definitely aims at the post-graduate training of their workers. I do not know whether you would care to tell the Commission what you think the value of post-graduate scholarships has been in this country in training workers both for teaching and research?—It has been the most valuable recruiting ground that we could possibly have had. From the moment we started the research institutes in this country we also started this system of post-graduate scholarships, by which we picked up young University men, not necessarily graduates in agriculture or from an agricultural college, but graduates in pure science as a rule, and put them into an agricultural atmosphere and into a research atmosphere, and gave them a scholarship for two or three years. Those were men who were meant to be recruited for the research service, who were to become research workers. We have extended the principle now to the men who intend to teach. We have a certain number of scholarships every year for graduates in agriculture—not in agricultural science, but purely agricultural graduates who want to teach or to become county administrators, or something of that kind. We take them for an extra term of education, and for some experience abroad. The post-graduate training of those men, I think, is even more essential than the training of the research workers. A man who proceeds straight away from college to begin to teach agriculture has a very limited vision. Very often his experience has been confined to one type of agriculture, and he has had no time to consolidate his knowledge. It is of enormous importance to his mental growing-up if you can give him a couple of years after his degree course just to round off his knowledge and complete it and extend it, and if possible give him the stimulus of seeing an entirely alien form of agriculture. It is a new scheme with us, so far as teachers in agriculture are concerned. I believe if teachers of agriculture, instead of repeating what they have learned from their Professors (who have taught perhaps the rather narrow Scotch routine), were taken to South Africa or to Canada and shown how farming was carried on there with its entirely different conditions (very high wages, large employment of machinery, and perhaps a lower standard of cultivation), although they might have nothing to bring back directly, they would be persuaded that the method of agriculture in which they had been brought up was not necessarily the only possible way of doing it.

52,855. For the giving of that latter kind of instruction, India is in a sense better suited than we are in Britain, inasmuch as it is a Continent; thus students might go from certain parts of India to, say, the Punjab and see methods which are quite new to them?—Yes.

52,856. *Dr. Hyder*: You said there was the danger of the student, who becomes a teacher after taking his degree, teaching just the same thing as

he had learn from his Professor. Suppose such a man, recruited as a teacher or administrator for India, went out there and merely repeated the formulæ that he had learned here, on a different soil altogether, he would not be of much value. How are we to guard against that?—I think that is a very real danger. One knows so often that an English-trained or a Scottish-trained agricultural student is pitch-forked into an entirely tropical or semi-tropical country, and he cannot unhinge his mind all at once and look at the thing as it is. He is pre-occupied with the way in which he has been brought up to do it. That is why, for instance, in devising a scheme of education for the directors and teachers of agriculture for the Colonies, we now insist that they shall not be sent straight to the work, but that they shall have a couple of years post-graduate training, one year of which must be spent in a tropical or semi-tropical country.

52,857. There is no such condition attaching to recruitment of officers for the different Provinces in India, is there?—Not that I am aware of. India makes its own regulations. I do not think it has fallen into line yet with the Colonial Office scheme.

52,858. You say in your note of evidence: "In attempting to give a direction to the agriculture of a country like India, we are assuming not merely that we can obtain a greater control over nature, but also that we can alter the habits of a congeries of peoples." How can you alter habits? Are there any means of bringing about a change in outlook or habits?—I suppose there is. That is the business of education and propaganda, is it not?

52,859. You think education has a great bearing on all this progress?—Entirely. You may do as much research as you like, but the only means of affecting action is by educating the people who are at work, is it not?

52,860. I daresay the circumstances are known to you, but at present we have in India a number of research workers, and everything is quite all right, but the people are not ready to receive the results, having no education?—That makes the problem very difficult, much more difficult than our own, because you are dealing with a comparatively uneducated community.

52,861. Here the level of intelligence created by education is much higher. We have no level whatever. We cannot read or write?—One may be a very good farmer without being able to read or write.

52,862. I am concerned with the application of results obtained by research?—I have not the slightest doubt that the problem of how to pass on knowledge to a very uneducated peasant population is a very real and difficult one. That must require very careful thought and study. Since Sir Thomas Middleton and I came into the English Agricultural Service, something like 35 years ago, we have certainly learned a great deal in the technique of getting at the farmer and persuading him to do things and showing him how to do them. It has required a generation to learn, so to speak, how you can bring knowledge to the farmer, and make it acceptable to him, and get him to act upon it. I can imagine it will take a very long time before you have worked out a technique for translating new practice into general action in an uneducated peasant community.

52,863. *Mr. Noyce*: Are the advisers you attach to the agricultural colleges research officers? They seem to have other functions, such as giving advice, making reports to the Ministry, and a certain amount of teaching?—They are primary Advisers. To what extent they are actually investigators themselves depends in many cases upon the temperaments of the men and upon their opportunities. What one finds is that some of them do embark upon individual investigations; others do not.

52,864. You spoke about experimental plots. Will you tell us exactly how those are run?—As a rule, the organiser decides that he wants to demonstrate the effect of a certain fertiliser. He will approach farmers in different parts of the country who, he thinks, are likely to take an interest in it, and he will say, "Will you put such and such lands at my disposal and let me manure them? I will supply the manures. The only trouble you will

have will be to weigh them up at certain times. I will come and help." Then he gets these plots laid out upon the man's own field, and he will very often have a meeting at these plots, and invite the local farmers to come and see them. Very often, nowadays, these plots originate through a discussion or a lecture. Perhaps there will be a discussion about the effect of basic slag upon grass land and, arising out of the discussion, an Organiser will get half a dozen farmers to agree to put it down on plots in their fields. Then he will try to get all these groups of farmers to come round and see them. There is a good deal of experimental work done in that way.

52,865. That is exactly the same as our demonstrations on the cultivator's own land in India?—Yes.

52,866. *Professor Gangulee*: One question about the Colonial Office scheme of recruitment. What is the arrangement? Is it that the recruits have to go to the Colonies and be trained in an institution there for two or three years?—It is not quite that. Recruits are engaged by the Colonial Office. They are then given a two-year probationary period. They are not even guaranteed an appointment at the end of it, but if they are to be administrators, non-technical men, they get a year's instruction in England. They would probably be sent to Oxford to take a course of economics, and so forth. Then they would be sent to Trinidad, to the Imperial College there, to get a year's experience of cultivation under tropical conditions, and then they would be available for appointments in one of the Dominions.

52,867. Are they being paid all the time by the Colonial Office?—Yes, all the time they are holding their scholarships, in order to pay their way.

52,868. At the end of the two years are they given an appointment?—They are then eligible for appointments. The Colonial Office promise to have a roster, and practically to provide for these men; but they are at liberty to say to a man, "You have proved to be unsuitable; you had better get off to some other job." The scholarship does not in any way bind the man or the Government.

52,869. It does not bind the Colonial Office to find the man an appointment at the end of the period?—No.

52,870. Does it bind the man to accept the Colonial Service?—I would not be quite sure. You had better look at the scheme. I know that was a point under discussion at the Committee. I have expressed the view that you cannot bind the man. You practically cannot enforce any contract against the man.

Sir Thomas Middleton: These men do give an undertaking.

52,871. *The Chairman*: Can you tell the Commission the composition of the Board of Management at Rothamsted?—Rothamsted is older than any of the modern organisations dealing with agriculture. It was founded as a private venture. It was then placed by Sir John Lawes under a Trust. He created a Trust to hold the property—the £100,000 endowment. He created at that time a Committee of Management to look after the experimental work. The Managing Committee consisted of four members appointed by the Royal Society, two members appointed by the Royal Agricultural Society, one member each appointed by the Chemical and the Linnean Societies, and one member of the family. That Committee has never been disturbed. Although the endowment income is less than £3,000 a year, the income derived from the State is in the neighbourhood of £26,000 a year.

52,872. Apart from that Management Committee, the Director is charged with the responsibility of administering the Institution?—Yes, he is responsible to that Managing Committee.

52,873. There is nothing and no body between the Director and the Management Committee?—No.

52,874. In your experience, how often is it necessary for a Committee or Board of Management of an institution such as Rothamsted to meet?—I think it ought to meet quarterly, three or four times a year.

Sir Daniel Hall.

52,875. Does it, in practice, do so?—The Rothamsted Committee always have one definite meeting in the summer at the Institute, at which the whole body formally goes round. Some of the active members of the Committee are down pretty often. They are personally interested in the work which is going on. The Institution of which I am now Director has copied very closely the government of Rothamsted. It has its Managing Committee of representatives appointed by learned societies and bodies connected with horticulture, and it has its four meetings a year, one of which always takes place at the Institute itself.

52,876. It is a real and important question in India, because while a journey from London to Rothamsted is a very pleasant experience, a journey from Madras, say, to Pusa is not always so attractive. So that the number of times that any Board of Management of any central institution, if that Board of Management has upon it representatives from various Provinces, meets in the year is a very important question. You think at least quarterly meetings should be held?—If it is a representative Committee of Management of that description. We are much more familiar, are we not, with what you might call management by committee in this country than you would be in a country like India. It is not as if the Committee intervened very much. There always will be some members of the Committee who are very active because of their personal interest.

52,877. But in the case of Rothamsted, all the members of the Committee have the opportunity to be active if they wish to?—Yes.

52,878. In India the members at a distance might find it difficult to be as active as those members nearer the institution. Who makes the appointments at Rothamsted?—Appointments are made by the Managing Committee at Rothamsted, but in the case of the Director the Ministry does now demand a sanction.

(The witness withdrew.)

The Commission then adjourned till 10.30 *a.m. on Wednesday, the* 15*th June,* 1927.

Wednesday, June 15th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L., (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } (*Joint Secretaries.*)

*Mr. H. FABER, Agricultural Commissioner to the Danish Government.

MEMORANDUM ON CONDITIONS IN DENMARK.

The Co-operative Movement.

First co-operative undertaking: The Credit Associations, supported by law of 20-6-1850 on "Credit Associations and Credit Offices for Owners of Real Estates."

All later agricultural co-operative manifestations originated from the farmers themselves.

The Rochdale system of co-operative distributive societies introduced by Reverend Sonne 1866; unsuccessful in towns, thriving in county districts. The co-operative supply stores in 1914 numbered 1,562 with 244,000 members, peasants, small-holders and labourers, nearly all in country districts. They were not looked upon with favour by the leading or ruling classes in Denmark, and therefore helped to foster a feeling of independence and class feeling among peasants.

Co-operative Societies for Production.

The first co-operative dairy society in 1882, to improve the butter of small farms and secure large uniform production. No help was offered from Government, not even for the education of managers for some 1,000 dairy societies. Private schools undertook this work. In 1909, 86 per cent. of all farms and small-holdings had joined a co-operative dairy society, and the percentage was highest among middle-sized peasant farms.

First co-operative bacon factory, 1887.—The same remark about the Government keeping aloof from the movement applies to the Co-operative Bacon Factories.

* See also Supplementary Note, Appendix 3, on page 808.

In both classes of co-operative societies, farmers were severally and jointly responsible for the loan, and they bound themselves for a period of seven to ten years to deliver all the milk and all the pigs they produced excepting only what they used themselves. Within the butter production I estimate the co-operative production to be about 90 per cent. of the total, and within the bacon production, 85 per cent.

1895: Co-operative egg collecting and export.—The co-operative activity only about one-seventh of the total, partly because private firms were forced by competition to adopt the methods of the co-operative societies.

Co-operation in agricultural production preceded other forms of co-operation.

Co-operative dairy societies sold generally to Danish exporters or to English firms who established branches in Denmark for buying direct, such as the Co-operative Wholesale Society of England and Scotland, Maypole Dairy Company and a few others. During later years, co-operative dairy societies have formed co-operative export societies for the export of their produce.

Co-operative bacon factories sold from the first through agents in London and merchants in other English towns. Later on a number of co-operative bacon factories joined to sell their bacon through the Danish Bacon Company, London, which handles about one third of the production.

The Co-operative Egg Export Society and the co-operative bacon factories collecting eggs are exporters of their goods in the same way as private Danish exporters.

Co-operative export grew naturally from co-operative production.

Much later came co-operative societies for joint purchasing. From 1898 to 1901, societies for joint purchase of feeding stuffs and of dairy machinery and implements were formed, and in 1916 a co-operative manure supply Society for the purchase of artificial manure was formed, as a direct move against what was believed to be an attempt by a private concern to exploit purchasers of manure. In a short time, 1,353 local co-operative societies with 67,000 members, representing farms of a total rateable value of £53,000,000, joined this Manure Supply Society.

Co-operative purchasing as a counter-move against trusts.—Among other co-operative societies may be mentioned a Co-operative Coal Supply Society, a number of cattle export societies, potato export societies, societies of seed growers and others, more or less co-operative.

The characteristic of Danish co-operative societies is that they always aim at only one object. If a new undertaking is to be started, an independent society is formed, maybe with very much the same members as are already joined in another co-operative society, maybe with the same chairman and so on. Therefore many Danish farmers are members of many—maybe twelve—co-operative and kindred societies.

The first milk recording society ("control society"), formed 1892. From 1895 to 1899, 128 societies were formed. Present number 1,167, with 35,000 members, 450,000 cows, or 30 per cent. of all cows.

Cattle breeding societies began 1884, now 1,077 societies with 27,000 members, 1,254 bulls.

Horse breeding societies began 1879, now 275 societies with 23,000 members, 360 stallions.

Other breeding societies for pigs, sheep and goats.

These societies are all conceived and formed by the farmers themselves, and only after they had proved their usefulness did the Government step in and offer grants while at the same time prescribing certain conditions.

The Government grants had at once a greatly encouraging effect, independent of the monetary value. Grants increased until 1912 when they were reduced.

Agricultural societies holding shows have grants from the Government as contributions to prizes. Previously, prominent large land-owners took the prizes, now they go chiefly to the breeding societies whose members are mostly middle-sized and small farmers. From 1912, came State grants for prizes for bulls, to be given only when reliable information of yield of milk, by quantity and quality, of their dams was furnished, and similarly for cows. At Danish agricultural shows it is now a condition, when showing dairy cattle, that full information of yield by quantity and quality of the bull's dam, dam's dam and sire's dam be given, and that the cow's dam on an average of all recorded years has yielded a certain annual minimum of butter-fat. These regulations, now enforced by the Government as conditions for obtaining the grants, are only what many agricultural societies had already voluntarily incorporated in their rules and which the Government afterwards have made applicable to the whole country.

It might be said, of the purely co-operative undertakings, for production, sale and purchase, that they were entirely self-help, and of the quasi-co-operative agricultural undertakings that the Government gave help to self-help, not only the initiative but the formulation of the Government regulations for the grants and the administration of the grants being totally or largely in the hands of the farmers themselves.

2.—*The Folk Schools.*

The truly remarkable development of Danish agricultural production during the last 50 years, which to a large extent is due to the activity and co-operation, the initiative and industry of the farmers themselves and, more particularly with regard to co-operation, to the smaller farmers, the yeomen peasants who own and cultivate more than two-thirds of the agricultural land of the country, has led inquirers, especially those from other countries, to look for the conditions peculiar to Denmark which enabled the Danish peasantry to achieve the results now so well known. And many of these inquirers have come to the conclusion that the Folk Schools, or as they are generally called, the People's high schools are responsible alone or almost alone for this development. Dr. Fred. Howe writes: "No great statesman has aided in shaping the country's destiny . . . It was the peasants . . . ."

I think this is a somewhat superficial view, ignoring the history of Danish agriculture prior to the Folk Schools.

The preservation of the land in the possession of the peasants is a result of wise legislation from mediæval times; the rural reform laws at the end of the eighteenth century which preserved and fixed the convenient distribution of land among large, midde-sized and small farms; the wise and humane management of the enclosures with the preservation of the small-holders and cottagers; the encouragement given farmers by loan and legislation to buy their holdings as freehold properties: all this together forms one of the fundamental conditions for the later development.

The agricultural development proper was, up to fifty years ago, largely or solely the work of the large farmers or estate owners, many of whom learnt extensively from visits to England and perhaps even more to Scotland. It was the owners and cultivators of large farms who met the disastrous times in the 'seventies of last century by changing over from corn growing to dairy farming and taught the smaller farmers to do likewise.

It was the same class of farmers who encouraged research work and, chiefly through an intimate collaboration between the Royal Agricultural

Society of Denmark and the Government, educated and appointed Government agricultural advisers who studied English methods of the breeding of cattle and other domestic animals, adapted them to Danish conditions and developed them further on original lines. Later on the various agricultural societies, both small local and large provincial societies, appointed local and provincial advisers to help and advise farmers, both large and small. The Royal Agricultural Society from 1836 has had sons of smaller farmers educated as pupils on selected large farms by three years' apprenticeships.

All these conditions were in existence, all these means of development were ready to hand for the small farmers, the peasants. They formed, so to speak, the material of the fire which only wanted the spark to light it. This spark came in the shape of the People's high schools.

The People's high schools are private voluntary schools for young men (five months in winter) and young women (three months in summer), the pupils being grown up, between 18 and 25 years of age or more. The schools are sometimes started by a farmer who feels that he can influence the young for their good; if the school grows, it is often taken over by a private joint stock company of farmers in the district. These schools, of which the first was started in 1844, owe their conception to the teaching of the Bishop Grundtvig, a Danish pastor, historic writer, poet, writer of hymns and patriotic songs. After the disastrous year 1864, many new schools were opened. They are intensely patriotic and religious. The teaching is mostly by lectures or talks, not by books, no lessons are set, and the teaching is never aimed at imparting knowledge for practical purposes, but only to widen the mental horizon of the pupils, to make them love God and their country and to take pride in their work, however humble.

Although open to all, these schools drew and still draw their pupils almost exclusively from the farming classes and are nearly all situated in the country districts. The cost of staying at these schools, with full board, lodging and tuition, is very low indeed and living is frugal, pupils and teachers living together as one family.

From these People's high schools have gradually sprung agricultural schools, also private and often the property of the principal until taken over by a private company.

There are at present fifty-eight People's high schools and twenty-eight agricultural, dairy and horticultural schools, and there is no doubt about the very great influence these schools have had on the development of Danish agriculture and co-operation. They develop a thirst for knowledge, first of a general kind, afterwards specified to agriculture, and improve the character of the pupils. Professor Orwin stated lately (Paper at the Society of Arts, 23rd March, 1927) about English farm workers: "At the age of 21, the farm worker has arrived normally at the summit of his profession." Many a Danish farm worker would at that age attend a People's high school for a five months' winter course and would, as soon as he could afford it, attend a six months' course at an agricultural school, and so qualify himself to become a small-holder.

Marketing Conditions.

There is nothing special about marketing conditions in the home market. They differ but little from those in England, except that market buildings with stalls are conspicuous by their absence.

It is when speaking about produce for export that special conditions are met with, as mentioned under "Co-operation."

In the seventies of last century, lumps of butter produced on the farms were bought by merchants, graded, milled and packed for export. The small productions, however high in quality, could not command a proper

price because unsuited for export. Hence the co-operative dairy societies, the first and foremost aim of which was to produce large uniform products for the sake of better marketing. Similarly with eggs.

By co-operative production for export, a great deal has been done to improve the marketing conditions, but in several directions a good deal remains to be done. Where a large firm of retail dealers, like the Maypole Dairy Co., buy their butter direct from large co-operative dairies for direct export to the retail shops, there the limit seems reached of what can be done to simplify marketing and of reducing middleman's cost to a minimum.

Oral Evidence.

52,879. *The Chairman*: M. Faber, you are Agricultural Commissioner to the Danish Government?—That is so.

52,880. You have been good enough to provide the Commission with a note of your evidence; would you like to make any statement in addition to that at this stage?—I am afraid it will be difficult to apply the Danish experience to Indian conditions, but at the same time, if I can be of any help with information I shall be very glad.

52,881. Is any active propaganda in favour of co-operation being conducted at this moment in Denmark?—No, I do not think you could say that.

52,882. No further propaganda is required; is that the position?—No, I think co-operation has almost reached the limit of what it is likely to accomplish.

52,883. And its membership is sustained from year to year without any effort of propaganda?—Yes; as a matter of fact, I do not know that there ever has been any propaganda.

52,884. I suppose there must have been work amongst the farmers by individuals who were enthusiastic?—From below, yes; but it is more the example. For instance, when they started the first co-operative dairy in 1882 that was quite a local movement; but, as soon as it was noticed how successful that was, the movement spread by itself without any real propaganda work. The example was propaganda, so to speak.

52,885. Then, as to inspection, does Government carry on inspection of, for instance, primary societies?—Of co-operative societies, no, none at all.

52,886. No Government inspection?—No Government inspection of co-operative societies; we have perfect freedom in forming societies; there is no law restricting it and there is no requirement of registration of societies.

52,887. *Professor Gangulee*: But your co-operative societies obtain Government grants?—No.

52,888. Are there no grants from the Government?—No, no co-operative society for production, purchase or sale has any Government grant at all. Government grants are given to societies for promoting the breeding of animals, milk testing societies and so on.

52,889. *The Chairman*: You mention, in paragraph 1 of your note, credit associations as being supported by the law of 20-6-1850. Are these credit associations for short term or long term money?—For long term.

52,890. All for long term?—All for long term.

52,891. You mention that distributive societies have been more successful in country districts than in towns, and later on in your note you point to the fact that in Denmark the society is usually a single purpose society?—Yes.

52,892. And that, where it is desired to undertake new work co-operatively, a new society is usually formed?—That is so.

52,893. In the typical rural community are there enough men of intelligence and experience to provide separate management committees for all these societies?—Very often the same people are members of the committees of several societies.

52,894. That is probably more often the rule than the exception in a rural community?—I should think so, speaking of small local societies.

52,895. Is it, in fact, difficult to find management?—No, I do not think we could say that, but I do not think it entails a very great deal of work as a rule on the part of the members of the committee.

52,896. You mention that a rule of several and joint liability is in vogue. Are there many cases in which unlimited liability has led to heavy charges on members?—No, I do not think so; there have been a few lately. The Society for the Export of Potatoes had a rather bad time of it and landed its members in some liabilities, but that has nearly all been wound up now. And, of course, we had a difficulty with a co-operative bank, which had to close; but that was not merely due to its activity with co-operative societies: it had also been active in outside fields and thereby incurred loss.

52,897. Are the several societies at work in any one rural community in touch with each other? Have they a co-operative council, for instance?—All the local dairy societies, for instance, would co-operate within a district.

52,898. And they are grouped?—Yes, but only those which have to do with co-operative dairying.

52,899. Otherwise there is no link?—There is no link between them and the egg collecting or bacon producing societies, until you come up to the central committee; there is a central co-operative committee for the whole country, and in that way they are linked; but not locally.

52,900. I am surprised to see that co-operation in agricultural production preceded other forms; I had imagined credit societies were the first?—Quite so; that is really so; but the credit societies were a kind of isolated movement; nothing followed immediately on that.

52,901. On page 106, you speak of breeding societies for pigs, sheep and goats, and you say there that the Government grant had at once a greatly encouraging effect, independently of the monetary value. How are those grants given and administered?—There is a special law giving these grants, but they are distributed by means of the agricultural societies.

52,902. By the co-operative societies?—No, the agricultural societies; they are quite different from the co-operative societies. The agricultural societies are generally much older than the co-operative societies, starting with the Royal Agricultural Society.

52,903. But then, are not these cattle breeding societies which you mention conducted on a co-operative basis?—They are not strictly co-operative; I mean, by a co-operative society we understand a society that either produces, buys or sells, and which distributes the annual surplus in proportion to the transactions each member has had with the society, there being no share capital at all.

52,904. You give it as your view that the preservation of the land in the possession of the peasants has been responsible for much of the agricultural progress?—Yes.

52,905. What is the law of succession in Denmark? Is it primogeniture? Does the eldest son succeed?—Yes, the eldest son would generally take over the farm. Outside the entailed estates there is no law that the eldest son shall succeed.

52,906. Supposing a farmer owning a small holding has two sons, is the farm split up on the father's death?—We have definite legislation dealing with the splitting up of land; it is not permitted for an owner to split up land at will.

52,907. What happens? Do they take shares in the holding, or does the eldest succeed?—No, the one that succeeds would buy the others out.

52,908. The Commission will read with interest what you tell us in your note as to the Folk schools and their effect on rural communities and the outlook of the peasant population. How far do you think the success of these schools has been due to racial characteristics? Do you think it

would be reasonable to argue that because these Folk schools have had so great a success in Denmark, they might therefore have an equal success in other countries?—Their whole existence is based on the remarkable work of Grundtvig; I mean his personal influence with the people was the foundation of the People's high schools; I think he might be looked upon as really a kind of prophet; if a similar prophet were to come forth in another country, I think he could probably have the same effect.

52,909. You touch on marketing conditions and you mention the existence of co-operative exporting societies; they do not themselves produce: they are societies for exporting; is that so?—No, producing co-operative societies in many cases also export. In other cases, certain producing societies would form an exporting society.

52,910. But co-operative exporting societies would never export the produce of non-co-operative procedures; is that so?—No, I do not know of any example of that.

52,911. The administration of the standard of produce for export is to some extent in Government hands, is it not?—Yes, for some of the products it is very largely so.

52,912. Take bacon, for instance; the enforced standards are enforced at the ports by Government; is that correct?—No, with regard to bacon the Government inspection is merely with regard to the health of the animal; the other grading for export is done entirely by the bacon factories as a voluntary commercial matter. The Government inspection is merely veterinary.

52,913. And not of quality?—No.

52,914. How about eggs?—With regard to eggs we have recently introduced legislation to see that the quality, as professed by the marking on the box, is in fact the quality of the goods.

52,915. And butter?—Yes, for butter we have an inspection in several ways; all our butter has to be made from pasteurised cream. We have inspectors to take samples to see that it is pasteurised. We have continual exhibitions of butter for quality, so that if the quality falls below a certain standard the creamery is deprived of the brand without which the butter cannot be exported, and so on. We have regulations for the net weight of the butter in the packages, and lately it has been prescribed that the date of production of the butter must be on the package.

52,916. So that now the actual container is of a pattern approved by Government?—The Government prescribes that the packets must contain a certain net weight, either 112 lb. or 56 lb., and so on. You cannot pack any way you like.

52,917. *Sir Henry Lawrence*: Is the general policy of Denmark protection or free trade?—There is no duty on agricultural produce, but there is duty on industry for the protection of industry.

52,918. Are any special measures taken to protect cottage industries in which the agriculturist, especially, is interested: industries of the village?—There is very little of that, I think.

52,919. There is very little industry in the villages?—Yes, outside agriculture.

52,920. There are no industries derived from agriculture which obtain protection?—Of course, the manufacture of butter and bacon and so on is really an industry; it is all done in large factories.

52,921. And that is not protected?—No; on the other hand, many of the things they use are protected, for which they have to pay.

52,922. Is there any importation into Denmark of butter and eggs from other countries?—Not to a great extent, but there is some, partly for home consumption and partly for re-export.

52,923. Does the Danish peasant consume butter, from other countries, of a lower grade than that which he himself produces?—Not so much the

peasant as the people in the large towns, but not much now; it used to be more. Now they have margarine.

52,924. I suppose the peasant is completely literate; you find no peasants who cannot read or write?—No, not for many, many years; we had compulsory school edcation from 1814.

52,925. In Denmark there is very little forest, is there?—Yes.

52,926. And there is no industry, open to the peasant, derived from the produce of local forests?—Not to any great extent; of course there are the plantations in Jutland.

52,927. Fuel plantations?—Yes.

52,928. Wood for burning?—Yes, the thinning out of the younger plantations; they can get work there. Of course, where there are forests there is also work to be done.

52,929. Does Denmark import all its fuel: coal and wood for burning?—I do not know whether we import much wood for burning, but we import all our coal, coke and oil.

52,930. What is the law which prohibits the union of small farms into large estates?—There is a law from very old times that if an owner of a peasant farm sells off part for small holdings, the remaining part must be of a certain size; he must not reduce his holding below a certain size.

52,931. *Professor Gangulee*: Can you tell us what that size is?—The trouble is that that law was made at a time when the holdings were measured in an artificial unit which is a unit of taxation; therefore, the area of that unit varies as to whether it is good or poor land; but on the average I think we could take it to be about 12 or 16 acres; he must not reduce his holding below that.

52,932. *Sir Henry Lawrence*: But is there any law to prevent the union of small parcels into a larger farm?—All joining together and all splitting up has to be approved by the Minister of Agriculture.

52,933. Through what agency: agricultural inspectors?—Every bit of land is registered, in what I think you call a cadastral survey.

52,934. This very detailed control is applicable to a population of about three and a-half millions?—Yes.

52,935. Is there any large official agency occupied over these duties?—That is a part of the work of the Ministry of Agriculture; one of the divisions of the Ministry of Agriculture is specially engaged in that duty, and under them are local surveyors.

52,936. The main object is to arrive finally at a distribution of the land in small economic holdings, not too large and not too small; is that the object?—Partly that, but also to preserve the graduation of holdings from the smallest to the largest.

52,937. There no intention to break up the large holdings?—There is a movement for doing so, and the large holdings have been somewhat reduced in number and size lately.

52,938. Is that the policy of the Government?—Of the present Government I should say yes; but still I think there would be a sufficiently strong feeling in the country to prevent a great diminution in the number of large holdings.

52,939. Amongst these other industries derived from agriculture, have you got the production of sugar? Have you got sugar refineries?—We have got sugar factories, yes; we grow a great deal of sugar beet: enough for the consumption of the country, on the average. Sometimes we export and sometimes we import.

52,940. Is that sugar protected?—To a small extent.

52,941. Can you tell us what sort of percentage the duty is?—No, I am afraid I cannot, but there is a duty.

52,942. *Mr. Calvert*: Is there a bounty?—No, there is a difference between the import duty and the inland taxation.

52,943. *Sir Henry Lawrence*: There is an excise duty, is there?—Yes, the protection is by the difference between the import duty and the excise duty.

52,944. Is it regarded as an object of Government to secure a supply of sugar inside the country?—No, I do not think that could be said.

52,945. But, as a matter of fact, the sugar factories do produce about enough sugar for the consumption of the country?—Yes; but nearly all of them belong to one private joint stock company; then there are two co-operative sugar factories.

52,946. *Sir Ganga Ram*: Does Government take any share of the produce of land?—No.

52,947. In any form? Is there no land revenue there?—Only taxation.

52,948. Is there a tax on land?—Yes, there are taxes on the value of the land.

52,949. Government levies a tax on land; is it on the value of the land or on the produce?—On the value of the land.

52,950. Not on the produce?—No, not on the produce.

52,951. What is the chief source of income of Government? Is there income tax?—Yes.

52,952. Does that income tax apply to holders of lands too?—Yes.

52,953. So that, in that form, the Government does tax the produce of the land?—They tax the income.

52,954. The income derived from the land is also taxed?—The total income of the individual is taxed.

52,955. What I mean is: when land is taxed, is the produce taxed as well, in that form?—No, I do not think that could be said. Do you mean anything in the shape of tithes?

52,956. *Mr. Calvert*: No; are profits from farming liable to income tax?—Yes, like any other profit.

52,957. *Professor Gangulee*: Or, in other words, do you tax agricultural income?—Like any other income.

52,958. *Sir Ganga Ram*: Then there is also a tax on the land?—Yes, because we have a property tax and an income tax; we have both.

52,959. Have you also a society for the supply of manure to the agriculturists?—Yes.

52,960. Do you manufacture any kind of manure?—Yes, we have some chemical factories.

52,961. Have you any factories for the manufacture of manures?—Yes, but they are private.

52,962. What manures do you manufacture?—Superphosphates, largely; I do not know whether we manufacture any other. We import.

52,963. I understand you have a law of primogeniture; that is to say, the eldest son succeeds to the inheritance?—That applies only to the entailed estates. Otherwise, the succession, I think, can be done by agreement; one of the sons will take over the farm; it may be the eldest or it may be one of the others if there are more.

52,964. Who decides who is to take the farm, or is there any law about it?—I do not think there is a law about it; anyhow, I do not know.

52,965. What crops do you grow for human food?—We grow rye, very largely, because our chief bread is rye bread; then wheat, oats for those who eat porridge. Then, of course, animal food: butter, bacon and eggs.

52,966. I understand the milch cows are all stall fed?—Only in the winter; it is an exception to stall feed in summer; but they are all stall fed in winter because of the severe climate.

52,967. With regard to credit facilities, how many years do you call long term and how many short term?—Long-term credit would often be sixty or eighty years.

52,968. What would short term be? Would that be anything up to ten years?—Generally, less than that, I should say; maybe one or two years.

52,969. When Government advances money to a society, what rate of interest do they give?—If the Government lend money to societies, I think it would be different in different cases. I do not quite know.

52,970. In your country, generally, at what rate of interest are Government loans taken? Is it four or five per cent.?—The money lent to smallholders, for instance, is, I think, four per cent.

52,971. *Sir Thomas Middleton*: With regard to the income tax levied on the profits of agriculture, what is the minimum sum on which income tax is levied in Denmark?—I cannot tell you the figures, but it is quite a small sum; they go very far down.

52,972. Then a great many agriculturists are liable to income tax?—Yes, certainly, most of them.

52,973. How is the income tax assessed? Is it assessed on actual profits or on some valuation of the holding?—You see we have to distinguish between income tax and property tax.

52,974. I know that; I am speaking about income tax?—People are asked to declare what is their income, and a good many do that. In other cases it is assessed locally, and it would generally be increased from year to year, if it is by assessment, until the owner cries out.

52,975. Then, in that case, the great majority of owners must keep careful accounts?—Yes, of course that does not apply to farmers; they cannot do that.

52,976. They do not do that?—Many of them cannot do that; some do.

52,977. Is it largely a question of trying how far one can tax?—I think so.

52,978. You have nothing corresponding to our Schedule "B"; I do not know whether you are familiar with that: that is where the farmer is assessed on his rental?—No, we have not.

52,979. Are the profits taken for a single year or over a series of years, say three years?—No, I think for a single year now.

52,980. So that if a man makes a heavy loss in one year he cannot get any relief from income tax?—The taxation has been so heavy that it has been said that very large landowners have every other year paid very largely and the next year nothing at all, because they have paid so much in the previous year.

52,981. That means that you do average; there must be some system of averaging?—No, but when he is paying in one year his full income tax for the previous year, that would reduce his income during that year by that amount, and therefore there would be next to nothing left to pay during the next year.

52,982. Do ordinary agriculturists go in much for mortgage credit?—Yes, if by mortgage you mean this credit association bond. They are not mortgages in the ordinary sense, because they cannot be foreclosed. About half the value of the land is mortgaged.

52,983. At half the value?—About half the value, yes.

52,984. Are these mortgages mainly taken for productive purposes for providing working capital?—Yes.

52,985. You do not hear complaints in Denmark that land is mortgaged for wasteful and unproductive expenditure?—I dare say we have some of that too.

52,986. You have some of it, but it is not a common complaint, is it?—No, it is not; I generally look upon it in this way, that the mortgage of land through the credit association in Denmark supplies the farmer with about half his working capital.

52,987. It is the normal method of securing working capital?—Yes.

52,988. And also, I suppose, the normal way of paying off co-heirs?—Yes.

52,989. Is that custom of paying off the co-heirs a very old custom in Denmark?—I believe it is, partly because of the prohibition or restriction of right to sub-divide.

52,990. Does that restriction of right date from about the middle of the eighteenth century, or how far back does it go?—I think it goes back much further than the middle of the eighteenth century; there was a law in the middle of the eighteenth century dealing with it, but I believe that was a re-enactment of either other laws or customs.

52,991. So that, in fact, this present custom is very ancient in Denmark?—Yes.

Mr. Calvert: Has it anything to do with the Code Napoleon?

Sir Thomas Middleton: I do not think so.

52,992. *Mr. Calvert*: Was the Code Napoleon never extended to Denmark?—Not very much on the subject of land. I think it is a kind of tradition in law in Denmark that, from very, very olden times, wherever there was a peasant farm there must always remain a peasant farm. You cannot obliterate it, you cannot cut it up into small holdings unless a certain proportion is left which is a peasant farm, and you cannot merge peasant farms into a large estate. You cannot destroy a peasant farm either by cutting it up or by merging it into something else.

52,993. Your total population is about three and a-half millions, is it?—Something like that.

52,994. What percentage are employed on the land?—Less than thirty per cent.

52,995. Including dependents?—Yes, living on agriculture, less than thirty per cent.

52,996. So that your Ministry of Agriculture have actually about one million people to deal with?—Yes, something like that.

52,997. You have been so successful in establishing co-operative societies in Denmark that one would like to ask if there have been any failures; have you had failures in establishing co-operative societies?—Lately there has been a failure of a co-operative bank.

52,998. That was a post-War failure?—Yes.

52,999. That was a result of the post-War boom period?—Yes. It does not affect the co-operative movement as a whole, but we have had a few others; we have had the co-operative potato export societies which have failed.

53,000. I want to find out which are the most difficult things you find to co-operate over, as it were. You have mentioned the potato as being one?—Yes. You are asking which subjects it has been most difficult to deal with co-operatively?

53,001. Yes. The failures have not been many I take it?—Very few. I think the greatest success has been in co-operative production.

53,002. What is rather surprising is that co-operative production should have so much preceded co-operative purchase?—Yes.

53,003. You are very large purchasers of feeding stuffs?—Yes.

53,004. But you co-operated to produce and sell long before you co-operated to buy, I think?—Not to sell, but to produce.

53,005. I am assuming that nearly all your feeding stuffs are now bought co-operatively in Denmark?—Largely, but by no means all.

53,006. With regard to manures, what is the position?—A large proportion is co-operative; I am afraid I could not tell you the proportion.

53,007. Do you co-operate much to purchase implements?—Not a very great deal, but to some extent; the dairy societies co-operate to purchase.

53,008. Do you find it most easy to co-operate for those things which are imported in large quantities?—I am not so sure. Co-operation to purchase manure, for instance, was a distinct move against what was looked upon as a trust, and a similar thing applied to feeding stuffs. The private merchants dealing in feeding stuffs in Jutland had some movement to join together. The farmers heard of that and thought that they were likely to be injured by such a combination of the merchants, and then they formed a co-operative society to do it themselves.

53,009. You mention that your agricultural societies are much older than your co-operative societies, and that you have a very large number of agricultural societies to-day?—Yes, that is so.

53,010. I do not think you have given us the date of the formation of the Royal Agricultural Society of Denmark?—I believe it is 1769 or something like that.

53,011. Long before the Royal Agricultural Society in England was formed?—Yes.

53,012. What are the essential natural assets of Denmark?—I think we have rather a good soil, except where there is too much sand, because we have none of these very heavy clays.

53,013. You are free from heavy clays?—Nearly all our land is glacial, and therefore where it is clay it is all mixed with sand and partly marl.

53,014. What about your climate? Is it not a dry, rather harsh climate?—Of course, the winters are severe.

53,015. Drying winds in the spring?—Yes, and what we suffer from is sometimes a dry spring, which is very bad for the corn.

53,016. And your climate makes it impossible for you to grow good permanent pastures?—Yes, it is not so easy, but still they are extending a bit.

53,017. They are again extending, are they?—I believe they are extending, yes; I think people understand better how to cultivate them now.

53,018. Unless the people of Denmark were to work hard, they could not live under such conditions?—They have to work hard, yes.

53,019. Your natural conditions force you to work hard and your people were induced to take education at a very early stage in your history? Compulsory education started in 1814?—Yes; but that, of course, was quite elementary education.

53,020. But that laid the foundation for Grundtvig's work?—I do not think so, because the remarkable thing about the People's high schools is that they are grown up people who go there to learn.

53,021. Yes, but if these grown up people had not been to primary schools they would not have gone back to school at Grundtvig's call?—I am not even sure of that; you see there is a long lapse between the primary school which a boy would leave when he was 14. He would then go to work on the land from 14 till he may be 22 or 23; then he would go to one of the People's high schools.

53,022. I follow that, but without attendance at the primary school, without the appreciation of the value of education which now characterises the people of Denmark, they would not go back to attend Grundtvig's schools after working on the land?—You may be right; I am not quite certain; they might not perhaps go to the agricultural schools, but I think they would go to the high schools all the same. You see, the high schools do not profess to teach them anything vocational at all. There is an element of religion in the high school movement.

53,023. *Dr. Hyder*: Before I take up your note of evidence, I have one or two questions of a general nature to ask you. The first question is this: Supposing we had all round the coast of England a tariff wall 10 kilometres high, I should like you to tell me what the state of Danish agriculture would be?—Even if you had that high wall, you would have to eat.

53,024. That is a different matter; perhaps they would produce the things here, you see, and eat; they would get the things to eat; the point is whether you would be able to sell?—If this country could produce enough food for its teeming population, we should be in a very bad state.

53,025. I have read your note with very great attention, and I was wondering whether the success of Danish agriculture and of its co-operation is not due to one factor principally, amongst others, and that is the existence of a very large free trade market right at its doors?—Yes, undoubtedly.

53,026. So that you assign some importance to that?—Undoubtedly.

53,027. My second general question is this: You have spoken a good deal about these schools; I was wondering whether the year 1864, as also the more material years from 1870 onwards, had something to do with the progress of the Danes and of Danish agriculture?—Undoubtedly it had.

53,028. I mean, after the year 1864 you had to look into yourselves; there had to be introspection; is that so?—Exactly; it took form in a special saying, that what we have lost outwardly we must gain inwardly.

53,029. And from that year you concentrated more on yourselves and your industry. I have now a few questions to ask you of a practical nature. What is the smallest economic size for the successful working of a co-operative dairy?—That is rather difficult to answer.

53,030. Let me help you; please correct me if these figures are wrong: "Each combines on the smallest possible area of land, about 150 members raising 800 to 1,000 cows in all and producing 1,500 to 2,500 kilogrammes of milk per cow a year." Is that the smallest size for economical working of a co-operative dairy?—The most natural way would be to measure by the number of cows.

53,031. 800 to 1,000 cows?—No, we can go below that I think; but, in a way, the larger it is the more economical is the working and so on.

53,032. Yes, but I am asking what is the smallest unit?—I do not see why you should not have a dairy with only 400 cows, or something like that. It would be a small dairy, but it could be done.

53,033. You would have all the appliances and so on, and would be able to compete?—Yes, I think so.

53,034. With regard to the control by the co-operative societies, does not the control extend to the feeding of the animals also: that when a man joins a co-operative milk society or dairy society he not only undertakes, as you say, to deliver for a period of seven to 10 years: he also undertakes to feed his animals according to rules which he has himself helped to draw up; is not that so?—I think there has been a great deal of that in former times, but more with regard to the feeding of cows giving milk for Copenhagen and other towns; quite as much there as with regard to the co-operative dairy societies. Then also, in former years, there were more definite ideas as to the influence of the food on the taste of the butter than are credited now. So that there will be less restriction in the way of feeding than there has been. At least, I think there would be not so much restriction as guidance which would be to the advantage of the farmer in feeding.

53,035. I mean they must all feed their cows and give them the kind of food which is proper?—Yes, of course they must feed them with good food.

53,036. What about the management of the societies? A man takes part in the management irrespective of his economic state; is not that so?—Yes.

53,037. All men are on a basis of equality?—Yes.

53,038. It does not matter if one man delivers 30,000 kilogrammes of milk while another delivers only 2,000; the man who delivers only 2,000 will be eligible for office?—Yes, and each man has a vote, one man one vote independently of the number of cows he may possess.

53,039. Have you a system of arbitration with regard to disputes among the members, and between the members and their society?—The societies have their by-laws, and sometimes they are enforced by the court. We have had cases where a co-operator refused to deliver and was compelled to do so by the court.

53,040. I was not quite clear about your remarks on Government supervision; to what extent does Government supervise the export trade?—With regard to the export of butter, the Government must give the right to the producer to use the official brand.

53,041. Yes, and if his butter does not come up to quality the Government has the right to withdraw the licence?—Yes.

53,042. That is one aspect of Government supervision?—Yes.

53,043. Is there any other aspect?—In order to have a right to apply the official brand, the butter must be made of pasteurised milk; therefore the Government inspects the dairies and takes samples to see that milk or cream is pasteurised. Then the butter must contain no more than 16 per cent. of water; therefore we have inspectors who take samples of butter and analyse them.

53,044. These are Government inspectors?—Yes.

53,045. So that the Government does come in?—Yes.

53,046. With regard to the fixing of the price of butter, how do you get on with the traders?—There is a committee of traders and of producers; in fact, there are two committees sitting independently, but they generally agree to fix the price every week for the butter.

53,047. There are some very good rules; the chairman of a joint committee is not entitled to vote; and if the voting is equal the president of the other committee has a casting vote; is that so?—It may be; these rules vary from time to time; that may be so at present; I am not prepared to say.

I am quoting from a report submitted by your people to the International Economic Conference.

53,048. *Mr. Noyce*: You say that the rural reform laws at the end of the 18th Century fixed the convenient distribution of land amongst large, middle sized and small farms?—Yes, rather laid down rules in order to preserve it.

53,049. What do you regard as large, middle sized and small farms in Denmark; about what acreage?—A middle sized farm would be something like 60 or 80 acres.

53,050. Is a small farm anything below 60 acres?—Yes, 20, 30 or 40 acres. Of course, we have small holdings which are smaller than that.

53,051. What is the smallest acreage from which a farmer in Denmark can make a living without any extraneous sources of income?—On good land 12 to 16 acres.

53,052. By dairying mostly?—Yes; that is, of course, arable land growing corn and roots for his cattle.

53,053. Would he go in for mixed farming on a holding of that size, 12 to 16 acres? Would he go in for both arable and dairy farming?—We do dairy farming on arable land; we do not distinguish between arable and dairy farming; nearly all our dairy farming is arable; six-sevenths of our cultivated land is arable.

53,054. No pasture?—No. On arable land we have grasses in rotation, but it is not permanent grass.

53,055. I notice that agricultural development in Denmark, according to your note, owes a great deal to the owners and cultivators of large farms?—Yes, that is certainly so.

53,056. Are they still in the van of agricultural improvement?—Some of them, but not so much relatively, as before, but they certainly have been very much the leaders.

53,057. To what do you attribute that; to the fact that the smaller farmers and small holders have grown up, so to speak, and do not need that help now?—Yes, many of them are very good farmers now.

53,058. *Sir James MacKenna*: Have you had any experience of co-operative societies for cattle insurance in Denmark?—Yes, we have cattle insurance; I believe they are small societies.

53,059. Has that been successful, do you know?—Yes, I think they are rather an informal kind of society; if there is a loss, the loss is distributed amongst the members and so much money is called in.

53,060. Do you know if there is a premium for insurance of an animal in a society?—I believe not more than that they are liable to be called upon to pay up whenever there is a loss.

Mr. Calvert: It is contributory insurance.

53,061. *Sir James MacKenna*: Are any diseases excluded?—I am afraid I do not know, but I think it might vary from one district to another. We have had special societies with regard to loss by foot and mouth disease, I believe.

53,062. Foot and mouth disease is the most prominent disease of cattle, is it?—We have had a bad epidemic; it is over now and we are almost free at the present moment.

53,063. Supposing Denmark had had the governing of India two or three hundred years ago, with a seventy per cent. agricultural population, what line do you think she would have adopted towards the development of India?—I am afraid it is not easy to answer that question; but of course 200 years ago we had seventy per cent. of our population agricultural.

53,064. *Sir Henry Lawrence*: And that has been converted into 30 per cent. now?—Our agricultural population is seventy per cent. less than 200 years ago.

53,065. *Dr. Hyder*: Are you quite sure about this figure of thirty per cent.?—I am, I know it has surprised many people.

53,066. Are you including the industrial work carried on on agricultural products?—No, this is agricultural proper.

53,067. Do you include people who work as butchers in the co-operative slaughtering of pigs?—No, they are properly industrial; they are trade union people.

53,068. *Professor Gangulee*: Your thirty per cent. is confined to the actual cultivators?—To cultivation, yes, to agriculture proper: cultivating the land, attending to domestic animals and so on, living on the farm and working on the land.

53,069. Does it include the manufacturers of butter or cheese?—No, that is purely an industry.

53,070. It is often asserted that the spread of education through your Folk schools preceded the devolpment of agriculture and the co-operative movement; is that right?—No, that is not right; the development of agriculture came before the People's high schools, but the People's high schools helped the small farmers by opening their eyes to the benefit they could get by imitating the large farmers in the way of applying scientific methods on their farms.

53,071. So that you first created the necessary environment for the acceptance of two things: first, your co-operative movement and secondly an institution like the People's high schools; is that right?—Yes, but in the opposite order. The co-operative movement of course was introduced, like many other good things we have from this country; it was the example of the Rochdale weavers.

53,072. In the middle of the 19th century?—Yes, it was introduced into Denmark in 1866 for the special benefit of the poor workers in a small town; it was introduced by their Pastor, and for years people worked to get that introduced and practised among the poor people in the towns, but without success, because these people were not alive to the use of it, and these co-operative supply societies in towns all died out. But the farmers appreciated them and introduced them into the country; they were alive to the value of it. That gave them their first lesson in co-operation; and, partly based on that lesson, came the success of the co-operative dairies when they were introduced.

53,073. But, as you say here in this note, the conditions were first created for the favourable acceptance of these two movements; one is the adult education movement and another is the co-operative movement?—Yes.

53,074. I should like to ask you about the process by which you created those conditions You speak here of the formation of the Royal Agricultural Society of Denmark. Can you tell us what part the Royal Society of Agriculture played in creating such conditions? What was the actual function of this Society?—The Royal Agricultural Society, as I believe I

mentioned, has done a great deal to educate sons of small farmers in farming. Since 1836 they have every year taken on a number of sons of small farmers to educate on selected large farms, giving them a three years apprenticeship, transferring them from one farm to another to three different farms.

53,075. No definite agricultural school was established by the Society?—Yes, I think they have established one agricultural school.

53,076. And in that way, by training the sons of farmers, the Royal Agricultural Society contributed to this development?—Yes, and by many other activities.

53,077. Was any legislation necessary to bring about the conditions which you refer to?—I do not know of any legislation aiming particularly at that

53,078. You speak, here, of your local and provincial advisers; where do they get their training?—At the Royal Agricultural High School at Copenhagen.

53,079. So that these advisers in Denmark are all trained in the agricultural schools?—Most of them would be trained there, not necessarily all, but the more prominent of them would be trained in the Royal Agricultural High School. Others would be trained in the other agricultural schools in the country.

53,080. You have twenty-eight agricultural, dairy and horticultural schools; are those schools run throughout the year, or are they merely seasonal schools?—They are generally only winter schools.

53,081. The cost of these vocational schools comes from the Government; are these Government institutions?—They are all entirely private.

53,082. Are they subsidised by the Government in any way?—The Government gives some subsidy, mostly in the form of bursaries to pupils.

53,083. From where are the staff of these twenty-eight agricultural schools recruited?—They are graduates of the agricultural schools.

53,084. Do you charge the students any fees?—Yes.

53,085. So these schools are not free?—No, they are generally started by men who make it their living.

53,086. Turning once more to your People's high schools, they are really an organised form of adult education?—Yes.

53,087. Is there any other agency in Denmark, besides the People's high schools, carrying on adult education?—Yes, I believe there are several.

53,088. Could you tell the Commission what part the Universities of your country play in this adult education movement?—Some of the principals or teachers in the schools would be graduates from the University, but not many.

53,089. The University does not, itself, take part in the adult education movement?—Not as a University, but some of the people of the University are interested in adult education; but that is more their private interest.

53,090. Are pupils, attending these People's high schools, drawn from the rural community or the city?—The pupils of the high school are nearly all from the rural districts.

53,091. The schools are situated in the rural tracts?—In the country, yes. Only of late have some sprung up in the towns. There is one in Copenhagen now; the people in the towns are beginning to take a little more interest in it.

53,092. Could you tell the Commission a little more as to the actual relation of the State with these People's high schools?—There is very little relation between them.

53,093. Is there no supervision from the Minister of Education?—Not with the People's high school I think.

53,094. No grant from the central Government at all?—Yes, I believe they have some grant.

53,095. But if they make a grant, do they make it without any condition? —The grant is given to all these schools together: agricultural schools, dairy schools, horticultural schools, and People's high schools all together, so that it is difficult for me to say how much the People's high schools get.

53,096. Supposing they obtain a grant from the central Government, could you tell us whether the central Government exercises any supervision or control?—There may be an inspector calling there once a year or something like that, but practically it amounts to nothing.

53,097. Are these People's high schools free institutions, or do the students who go there have to pay for the tuition?—Just the same as the agricultural schools, the man who starts them makes a living by it and the pupils have to pay, but it is very cheap.

53,098. In these high schools I understand there are no vocational courses at all; do you teach agriculture, horticulture or anything of that sort in these people's high schools?—No, they do not profess to teach anything of that sort.

53,099. What do you think was the first step that Denmark took towards cattle improvement?—Cattle shows.

53,100. Would you not say the milk recording society was the first step? —Oh, no; that came much later.

53,101. You speak of cattle shows; were they organised by the State?—No, not organised by the State but subsidised and helped by the State; the State gave a grant to help to pay for the prizes.

53,102. Did the Royal Society take part in organising these shows?—No, it is more the local agricultural societies who arranged the shows. The Royal Agricultural Society, as such, does not arrange shows.

53,103. In your opinion the organisation for cattle shows was the first step?—Yes, you might say that.

53,104. What was the second step? I want to know how you eliminated the uneconomic cow; what was the process you followed? First, of course, you had shows by which you encouraged the best breeds and types?—Yes, and thn we had breeding societies where we also encouraged the use of the best animals. Then we have the milk-recording society, which eliminates the poorest.

53,105. Then, is it correct to say that the practice of keeping milk records of individual cows has been the basis for the steady improvement in the general quality of Danish dairy cattle?—Yes.

53,106. You must have records of individual cattle before you strike the basis of improvement?—Yes, I think that is a very important thing.

53,107. So that the milk recording societies that you mention in your note formed a very essential part in the development of live-stock improvement schemes?—Undoubtedly. I do not know whether it will be of any interest to you, but when the first milk-recording society had been working one year, a report was written on it, and they calculated for the different cows the cost of production of a pound of butter; they found that one cow could produce a pound of butter for 6d. while another cow in the same herd required 2s. 8d. That showed them, in a very practical way, that they had better get rid of the second cow.

53,108. You have not said anything about your research work in Denmark; is that carried on in the central research station at Copenhagen?—That, of course, is carried on by the Government, but several branches have been started privately and then taken over by the State.

53,109. At the present time, research is solely conducted by State agencies? —No, not solely; the agricultural societies do a good deal of work in that direction as well, besides some private work.

53,110. And these societies that conduct agricultural researches are in touch with the central institutions?—Yes, they are.

53,111. *Mr. Calvert*: Where you have members of co-operative societies who bind themselves to supply milk and so on for a period of seven years, are there many cases of breach of such an agreement?—No.

53,112. Have you, in Denmark, any large body of landlords who do not themselves cultivate?—No, very few.

53,113. Are you troubled at all by the absentee landlord?—No, we hardly know him.

53,114. I have heard it said that a large part of your success is due to the fact that you do not allow lawyers to interfere with agriculture; do lawyers play any large part in your agricultural policy?—You see, such a large proportion of our agriculturists are owners of their land that there is less chance for the lawyers to come in.

53,115. You have several times mentioned legislation; legislation requires a legislature enlightened on agricultural matters. Have you got, in your legislature, any actual practical farmers?—As members of our legislature, yes many.

53,116. *Dr. Hyder*: I have heard it said that when attention was drawn to the smallness of the legislative building in Copenhagen, the Minister replied that the legislators were peasants?—The building is pretty large now, but many of the legislators are peasants. Some of our Ministers have been peasants.

53,117. *Mr. Calvert*: You have, in your Legislature, actual cultivating farmers?—Yes, they are really a larger proportion in the legislature than their proportion to the total population; they are undoubtedly over-represented.

53,118. Is your agricultural policy guided by the practical farmer, or by other interests?—By the practical farmer, very largely.

53,119. When you speak of Government in this note, you mean the Ministry of Agriculture?—Where, for instance?

53,120. On page 106: "grants from Government"?—That is on a proposal from the Minister and accepted by the Government; that means the Riksdag vote on the Budget or by a law voted on and carried through the House.

53,121. So that that practically means that your Government is a Government of practical farmers?—No, I do not see that it means exactly that, but there are practical farmers in the legislative party, and there are practical farmers sometimes amongst the Ministers.

53,122. Your Government does take active steps to protect farmers against, say, the import of animal diseases or crop pests?—Yes, of course we have our Veterinary Service.

53,123. You have a State Veterinary Service?—Yes.

53,124. So that Government does play a part in the development of your agriculture?—Government has played a very large part indeed.

53,125. Quite apart from the self-help movement, you have a separate organisation by Government for the protection of agriculture?—I do not see how you can separate them like that; Government has done many things for the help of agriculture in centuries past, and has continued to do so.

53,126. But you stress the fact that the co-operative movement has been so largely a farmer's movement?—That is a different thing; the Government has been rather averse to the first co-operative movements, particularly the co-operative supply societies.

53,127. The Government has not interfered in the organisation of agriculture by the peasants themselves?—Now you are speaking about co-operation, I understand?

53,128. I am speaking of two quite distinct things: there is the organisation of agriculture along co-operative lines?—No, agriculture is not

organised along co-operative lines; that does not apply to our conditions at all.

53,129. Do you draw a distinction between co-operation and organisation?—Yes, certainly; we have a distinct agricultural organisation entirely independent of co-operation and existing before co-operation.

53,130. What organisation is that?—Agricultural societies.

53,131. Then you have this third line of activity by Government in protecting farmers from insect pests, animal diseases and so on?—Yes, but is not that what all Governments in civilised countries would do: I mean protect against diseases, and so on?

53,132. The point I am taking is that Government can only do what the legislatures permit them to do, and what the legislatures do depends upon the personnel of the legislatures?—Yes, to some extent.

53,133. I was trying to discover to what extent your Government really is the practical farmer sitting in his best clothes?—I think that is straining it rather; Government is not only that. I am afraid I do not quite follow you. I do not quite see your point.

53,134. The difficulty we have in India is that the practical cultivator nowhere appears in our legislatures; the landlord rent receiver appears, but not the actual cultivator. We have in England a very similar thing, where the big landlord looms large in agriculture, but the actual farmer does not take a prominent part in the legislature?—Yes. With us they do.

53,135. Dr. Howe, in that book you quote, states that there are many thousands of petty holdings in Denmark of round about two and a half acres?—Not independent holdings.

53,136. He gives a figure of several thousands?—Does he mean that people live on them?

53,137. That is what I was going to ask you?—No, that is wrong; nobody could live on that.

53,138. What are those holdings?—They are held by labourers who have their work on the farms in the neighbourhood but who work those small holdings in their spare time; there are plenty of them.

53,139. They are what we call, in England, allotments?—Yes, perhaps you would call them that; anyhow, it is land which is cultivated in their spare time by people whose chief occupation is as labourers on farms, or they may be artisans and so on; the village blacksmith or joiner may have a small holding like that which he works in his spare time.

53,140. Is there, in Denmark, any complaint on the part of the farmers against primary education?—Oh no, there is nobody in Denmark against it.

53,141. They do not say it is unsuitable for agriculture?—No, but the primary education, of course, is for children. Agricultural education is something quite different; that comes later on.

53,142. I mean education of your boys up to fourteen years of age?—Yes, but they do not learn agriculture.

53,143. No, but do farmers complain that the type of education offered to boys up to fourteen years of age unfits them them for agriculture?—No, I do not think so.

53,144. Who directs your educational policy?—We have a Minister of Education; sometimes there may be a very strong man in a position to influence it, but, technically speaking, it is done by the Minister.

53,145. Is that Ministry guided and influenced by the opinions of the actual cultivators?—Through the legislature, yes; the actual cultivators being strongly represented in the House would have an influence on the legislation that would govern education.

53,146. If you remember, about 1913, when the American Government set up a committee to inquire into agriculture in Europe, they submitted reports

touching on this question of education, and they stated that only in two States did they find no complaint against education from the farmer's point of view: one State was Denmark, and the other was, I think, some American State. I was trying to find out from you, exactly, what there was peculiar about your system of education of children which made it so exceptional to the general rule?—The primary education, of course, is not a very thorough education in a way, you might say; boys leave those schools at fourteen, and then go on to practical farming work. Perhaps they have not been spoiled by the school education to the extent that they despise practical farm work; and on that point I should like to mention that in some districts, at least, it has been so arranged that in the village school boys go to school one day and girls the next; so that the boy only goes to school every other day, spending every other day on the farm helping his people to mind animals and so on, and taking part in the agricultural life. That, of course, would preserve them completely from that taint that attaches to some primary education. But another point is this: I believe that the distinction between the primary education and the agricultural education coming on much later in life is perhaps something peculiar to our country; our agricultural schools very seldom give any teaching of practical agricultural work; therefore they require the pupils to have a thorough practical knowledge of agriculture before they come to the schools. In the Royal Agricultural College in Copenhagen it is stipulated that a pupil must have been for three years carrying on practical agriculture before he can be admitted to the school.

53,147. But, coming down to the primary or elementary education up to fourteen years of age, the American State which had no complaint to make against its system of primary education ascribed that to the fact that its legislature was largely manned by practical farmers; that is the reason why I am asking you about your legislature and why there are no complaints in Denmark against your primary education withdrawing the best brains from the soil?—I would not like to say there is no such complaint at all; of course, all farmers' sons cannot go on farms again: the land cannot carry the population.

53,148. From what class are your teachers of these elementary schools, teaching up to fourteen years of age, drawn?—Many of them would be farmers' sons.

53,149. They are not drawn from your towns?—Not solely; largely of course they would, but some would be in touch with agriculture.

53,150. *Sir Thomas Middleton*: What about the school holidays? At what periods of the year do the primary schools get their holidays? Are agricultural requirements taken into account in the fixing of the holidays?—It is generally in July and August, or something like that.

53,151. Have the local people any say in the fixing of the time for the school holidays?—The elementary schools, of course, are managed by local school committees entirely, in which the farmers would be represented.

53,152. Do they endeavour to get the holidays at the most convenient times for the agricultural population?—Yes, I believe a good deal is done in letting the children off during harvest time; I think that is done in many cases.

53,153. *Mr. Calvert*: In the primary schools teaching up to fourteen years of age, do the teachers undergo any special training in agriculture?—No, I do not think they do.

53,154. Is there, in Denmark, any sharp cleavage between a rural party, a farmers' party, and any other?—There is a certain cleavage there, undoubtedly.

53,155. Does the rural interest find opposition?—No, generally speaking I think the whole population is alive to the fact that the agricultural interest is so largely predominant in Denmark that there would be no opposition; I mean they would all feel that they more or less live by agriculture.

53,156. That is to say, the needs of the practical farmer are paramount?—To some extent that is so, yes.

53,157. *Sir Ganga Ram*: Is not rye an inferior grain as compared with wheat?—That is a matter of taste.

53,158. Are they sown at about the same time?—Yes, about the same time.

53,159. I find that the outturn of wheat is 1·07 tons per acre, while that of rye is only one-third of a ton?—I have not got the figures here.

With rye on 765,000 acres you get 265,000 tons, while with wheat on 248,000 acres you get 259,000 tons.

Mr. Calvert: The wheat is on the better land.

53,160. *Sir Ganga Ram*: Is it due to the quality of the land?—I think we sow our wheat in a favourable position in the rotation; wheat is treated favourably by Danish farmers. There are many considerations on the question of whether wheat or rye pays best to cultivate. I have got some figures here in my book, from the year 1909 to 1913, showing that of wheat we had 43 bushels per acre while of rye we had 27.

53,161. Then, why do people prefer sowing rye to sowing wheat? Is the increased outturn of wheat due to the class of land on which it is grown?—I am afraid I am not enough of an agriculturist to be able to answer that question. Parts of our country are unsuited for wheat, both as to climate and as to soil.

53,162. What is the law governing the sale and mortgaging of land? If a man happens to be a spendthrift, can he sell or mortgage his land without consideration of his family?—If he is the owner of the land he can sell it, yes.

53,163. Is there no law prohibiting the sale of land under those circumstances?—No.

53,164. If he happens to be a spendthrift?—No.

53,165. *Mr. Calvert*: You limit the area of the holding?—Yes, he cannot split it up without permission, but he can sell the whole of his property; he could get permission to sell part of it.

53,166. *Sir Ganga Ram*: Supposing a man gets into debt, can his land be sold in discharge of the debt?—Yes, it can.

(*The witness withdrew.*)

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Note on the organisation and scope of the work of The Rowett Research Institute.

It is understood that the Commission wish me to give evidence on the organisation and scope of the work of the Rowett Institute rather than on Indian agriculture. This statement is, therefore, confined to an account of the Institute.

Accommodation and Facilities for Research.

The Institution consists of:—

(*a*) Departments of Physiology, Biochemistry, and Pathology, in which these sciences are studied in relation to the fundamental principles of nutrition.

(*b*) An experimental stock farm on which feeding and other experiments of immediate practical interest are carried out under ordinary farming conditions.

(*c*) A library and statistical department.

(*a*) and (*c*) are accommodated in central buildings with the necessary laboratories, animal houses and other accommodation required for research. These buildings, which were erected in 1922, are fully equipped and suited for their purpose.

The experimental farm, which is in course of development, extends to between 700 and 800 acres. When completed it will have departments for (*a*) milk cows, (*b*) beef cattle, (*c*) sheep, (*d*) pigs, and (*e*) poultry. The pig department, in which there are between 400 and 500 pigs, is established, and the dairy department, with about 60 dairy cows, will be established before the end of the present year. The other departments are partly developed. Each of these departments will have as its head a practical expert, who has had a training in the science of nutrition and has specialised in that particular branch of animal husbandry.

Staff.

Including the Director, the Secretary and Treasurer and the Statistician, there are thirteen members of the permanent staff. In addition, there are usually two or three post-graduate research students and one or two temporary workers, either voluntary or employed for a period to assist with an accumulation of analytical work.

At present there are sixteen temporary workers employed on investigations promoted and financed by the Empire Marketing Board. Six of these are engaged on work in connection with human nutrition, eight on work in connection with the nutrition of farm animals, and two employed in reviewing the literature to assemble all the available information bearing on the subjects of the investigation. Of these sixteen workers, only six are working in the Institute itself. Six are in Kenya Colony, and four are working under the Board of Health for Scotland in conjunction with the School Medical Officers in the four chief cities of Scotland.

Organisation of work.

Most of the problems of nutrition, which are of immediate practical importance, are of such a nature that the investigation of them calls for, first, teamwork by workers with a knowledge of different branches of the science of nutrition, and, second, continuity of work. An attempt has been made to attain these ends. The Institute works as a unity on the larger investigations, each department studying its own aspect of the problem. The data which are accumulated in the statistical department as the work proceeds are reviewed periodically by the Director and the senior workers in conference, and the work adjusted from time to time in the light of the results obtained. The actual workers engaged on different parts of the investigation may be replaced by others, or additional workers may be drawn in for a period to assist in the analytical work. But, though the personnel changes, the continuity of the work is maintained.

In addition to these major investigations, there are, of course, always other pieces of research running in which only one or two people may be engaged.

The Institute also carries out joint work with other institutions, especially with the Nutrition Institute at Cambridge University, the Department of Agriculture of Northern Ireland and various colleges of Agriculture in Scotland and England.

Recently arrangements have been made through the Empire Marketing Board for linking up work at the Institute on the nutritive value of pastures with work of a somewhat similar nature either in progress or about to be begun in New Zealand, Australia, parts of Africa and Palestine, and in human nutrition two joint investigations are being carried out—one with

the Kenya Medical Service on native dietetics and the other with the Board of Health for Scotland on the nutrition of children.

The data from this extra-mural work are assembled at the Institute where the literature of the subjects investigated is being reviewed and the information arranged in an easily accessible form.

This extra-mural work involves a continuous exchange of information and suggestions between the senior workers of the Institute and those of the institutions with which joint work is done. The resulting accession of fresh ideas is a stimulus to original thought, and the accumulation at one centre of a mass of data bearing on the one general problem, but collected from different parts of the Empire by workers studying the problem from different points of view, are of great value both to those actually engaged in the research and to those responsible for the initiation and general direction of the investigations. There is reason to believe that this joint work has been of mutual benefit to the Institute and to the other institutions with which work has been done.

Nature of work.

The two main aspects of animal nutrition are (*a*) the energy requirements which determine the amount of food needed, and (*b*) the material requirements which determine the kind or composition of the food needed. The Nutrition Institute at Cambridge University has devoted its fundamental research chiefly to the question of energy requirements. This Institute has tended to concentrate on the material requirements. The work, therefore, consists chiefly of investigations on the requirements of animals for constructive material, e.g., protein, lime, phosphorus, iron, iodine, etc., and on the factors concerned in the assimilation and utilisation of these, e.g., ultra-violet irradiation and vitamins.

It is known that when there is a deficiency of one or more of these substances in the diet, the animal is unable to get the full benefit from the food eaten. This is the cause of considerable economic loss in stock farming. It is also known that certain diseases may arise from these deficiencies, and it is believed that animals fed on "deficient" diets are more susceptible to certain infectious diseases. The investigation of the problems concerned with these conditions is, therefore, of great importance in animal nutrition. Further, information obtained in the course of the investigation has a direct bearing on human dietetics.

Finance.

The work of the Institute, apart from the Experimental Farm, requires an expenditure of about £11,000 per annum.

The Institute has an endowment for the library, which yields £250 per annum. There is another small endowment and certain contributions. These together do not exceed £500 per annum. The balance of the expenditure is met by a grant from the Treasury on the recommendation of the Development Commissioners.

The gross expenditure on the Experimental Stock Farm amounts to about £12,000 per annum. This is balanced by receipts of about the same amount from the sale of produce. The practical experimental work carried out on the farm is, therefore, self-supporting. There is an endowment of £10,000 which yields an income of £475 per annum. There is no grant from public funds for the work of the farm.

Oral Evidence.

53,167. *The Chairman*: Dr. Orr, you are Director of the Rowett Research Institute, Aberdeen?—Yes.

53,168. Are you at all familiar with Indian conditions?—Only at second hand.

53,169. I have very few points to ask you about. At Aberdeen you have the research work into animal nutrition and the research work on human nutrition going on side by side?—Yes.

53,170. Is it an important advantage to have them both in the same institute?—In my opinion it is very important, because the fundamental principles of human nutrition and of the nutrition of farm animals are the same. As a matter of fact, the advantages in our knowledge of human nutrition have got to be made through experiments on animals; they are usually made by experiments on small animals, such as guinea pigs and rats, although experiments on animals such as pigs have probably a more direct bearing on human nutrition than experiments on highly specialised animals like guinea pigs and rats. Furthermore, at a station like ours, where one can work on large groups of animals, the researches are more likely to be of practical value than in a laboratory in the centre of a city where one can only work on small groups of small animals under highly artificial conditions. Another advantage is that if one is doing research on human nutrition as well as on the nutrition of farm animals, one is kept in touch with the leaders of thought in the schools of physiology attached to medical schools, whereas, if one is limited to farm animals, one loses that immediate contact with the leaders of thought in the medical schools. One could give many instances of cases where the problem of human nutrition is exactly the same as the problem of animal nutrition, and where information obtained on one side is of importance on the other, for instance, in the question of ricketts in children, goitre, and so on.

53,171. How far would it, in your judgment, be practicable to get the advantage of close touch between the research workers in the two types of institutions if the work of human and animal nutrition were to be carried on at centres, let us say 100 miles apart, but in touch with each other?—What would happen then would be, that at both centres a large part of their work would be identical; the fundamental work would be pretty much the same in both cases.

53,172. It means duplication?—It means duplication, though that is not always a bad thing; but I think it would retard and stultify work on animal nutrition if the people engaged on it were prevented from doing the fundamental work which is the same in animal nutrition as in human nutrition, and from keeping in touch with the people who are working on the same subject, but with the object of applying that information to human beings instead of to milch cows, beef cattle, and other farm animals.

53,173. So that there is immense advantage in having the two types of workers side by side at the same institution?—In my opinion, there is. I should say that the work at the institution to which I belong is for agricultural purposes; we draw all our grants for those purposes; but, as a natural process of development, we have got more and more into touch with people working in the medical schools, perhaps on account of the nature of the work we are doing. Although the work was begun primarily with the object of obtaining information which could be applied in stock farming, yet the information we have got out has interested people who were working on the same subject with a view to rearing healthy children, and so on.

53,174. Do you keep in close touch with the work on plant nutrition?—No, except in so far as our work leads us into that province. For instance, we have been doing work which has led us into the province of the physiology of plants. What we do in that case is to link up with some institution which is working on that subject. In that particular case, as a matter of fact, we interested the Department of Botany at Aberdeen University, and carried out a joint investigation with them, they concentrating on the plant physiology side and we on the animal physiology side.

53,175 There is a suggestion at this moment, is there not, that the class of manure used on the land on which a particular crop is grown affects the nutritive value of the grain, quite apart from its effect on the bulk of the crop; for instance, it may have some bearing on the vitamin content of that grain?—There is no doubt that the application of manures affects the nutritious value of the crop. It certainly affects the mineral contents.

53,176. Is that work which comes within your survey?—That would come within our territory, because in that case we are interested in the nutritive value of the plant from the point of view of the nutrition of animals.

53,177. Are you, in fact, engaged on work on that particular problem?—We are engaged on kindred work; at the present time we run certain plots manured differently, and then test the nutritive value of the material grown on those plots; but that is not from the point of view of being interested in our crop growing, but from the point of view of the plants grown under the different conditions having different nutritive values.

53,178. You have given it as your view that it is very advantageous to have workers on human nutrition and on animal nutrition side by side; have you suffered any disadvantage from the fact that part of the research on animal nutrition is being carried on, not at Aberdeen, but at Cambridge?—No, I think it is an advantage to have two institutions working separately, for this reason, that if you have a single institution and a very strong personality at that institution, the whole institution takes its colour from the strongest man in it and tends to get into one narrow line. There is no man able to cover the whole field efficiently. If you have two institutions, one institution is more interested in one line and another institution in another line. If the two institutions are working together hand in hand as they should, there is a continual exchange of ideas, and also an exchange of workers, which tends to keep both institutions better balanced and more directly on the line along which they are likely to get results of economic importance.

53,179. In the case of Cambridge, are the workers on animal nutrition in touch with the workers on problems of human nutrition?—I do not think they are so interested in human nutrition at Cambridge as at Aberdeen.

53,180. *Sir Thomas Middleton*: Because they are dealing with the energy requirements of animals?—The two institutions are dealing with different aspects. I should explain that the Cambridge institution, they are more interested in the energy exchange and in the energy requirements of animals. The energy requirements of farm animals bred and fed for the express purpose of transferring energy rapidly from one to another are different from those of human beings. Hence the main work at Cambridge has meantime no direct bearing on human nutrition. In our institution we are more interested in the material requirements and the effects of deficiencies of various nutriments in foodstuffs. We are working on the question of what is required to give a complete diet so that it will not be deficient in iodine, phosphorous, or anything of that kind. We are interested in rearing young animals from the point of view of insuring that all the numerous subjects required for growth will be in the ration. The medical people are interested in the same aspect of nutrition from the point of view of infants and school children. It is, really, fundamentally the same problem. Hence our main line of work meantime has a direct bearing on problems of human nutrition.

53,181. How far do you regard the results obtained by experiments on rats as a firm indication of the nutritive value of particular foods to human beings?—In a general way, the requirements of all mammals are pretty much the same, but there are differences in different species. For instance, you could feed a guinea pig on a ration which would cause death to the guinea pig within three weeks from scurvy, while you might feed almost any farm animal on the same ration and it would not die of

scurvy in three months, or six months, or as far as we can see at present, it would not die of scurvy at all. So that, although there are certain fundamental things which are exactly the same, the requirements of the species vary; the results obtained on cows are not directly attributable to rats or guinea pigs, and *vice versa*. At the same time all classes of animals need so much of various different kinds of things. I am not sure if I make my meaning clear?

Yes, that is the point.

53,182. *Mr. Calvert*: If you deprived a series of animals of different genera of a specific chemical such as iodine, you would expect similar results throughout?—Ultimately yes, but one animal might stand up a long time, while another animal might go down much sooner.

53,183. But a deficiency of a chemical like iodine would have similar results?—It would have similar results ultimately.

53,184. *The Chairman*: In the field of animal nutrition, do you think it likely that the results you obtain at the Rowett Institute would be applicable to Indian conditions?—I think some of the results we are obtaining will be of interest to the people who are studying similar problems in India. I think, for instance, our work on iodine would interest Colonel McCarrison. I think our work on pastures would interest all the people who are studying pastures in India; I think our work on the mineral deficiencies in young animals would interest all the people who are studying those problems. As a matter of fact, many of these people have been to the institution at various times and have discussed the Indian problems with us; it is from those discussions and the publications that I have learned what I know about animal nutrition in India.

53,185. But I take it one has to be careful in coming to the conclusion that a particular result obtained at one centre is directly applicable to the feeding of animals at another centre, because, quite apart from the possibility of the fodder being different in nutritive value, the digestive capacities of the local ox may vary to a very important extent?—There may be a little difference, but I do not think there will be a great deal of difference between the digestive capacity of the two animals of the same species. There are other conditions, however; for instance, the amount of sunshine is a very important factor. We found that when comparing the results we were obtaining in the north of Scotand with those being discovered in South Africa. The abundant sunshine in South Africa enabled animals to carry on without showing signs of malnutrition on a diet on which animals in Aberdeen would show signs of malnutrition, because the sunshine in Aberdeen is much less than in South Africa. The temperature and all the local conditions have an important bearing on problems of nutrition.

53,186. The whole of the environmental conditions have to be taken into consideration?—Yes. The general principles might be worked out anywhere, but the application of those principles to a practical local problem would need to be done in the locality itself.

53,187. Do you see anything of Indian students at the Rowett Institute?—No, I do not think we have any Indian students at Aberdeen.

53,188. Do you happen to have met Dr. Warth, who is working at Bangalore?—No, I have not met him.

53,189. Are you at all familiar with any of the work that is going on in India?—Dr. Warth has written two papers, one in 1924 and one in 1925, but in both those papers, so far as I remember, he was rather indicating the amount of work that required to be done, and the small amount of work that had been done in the past, than indicating any large volume of work which had already been done.

53,190. *Sir Thomas Middleton*: He has just got his first paper out in 1926?—I have not seen that. I know the lines on which he is working; he indicated that in a paper in 1924 or 1925.

53,191. *Professor Gangulee*: He is more or less concerned to find out the digestive coefficient and to see whether Armsby's method is suitable for India?—Yes.

53,192. *The Chairman*: Do you think it would be useful if there were closer touch between your own institute and that of Bangalore, or will that emerge naturally as the result of reading each others publications?—It will emerge naturally in time, as is shown by the fact that Mr. Smith, the Imperial Dairy Expert in India, came to see us because he knew we were working on the problem that he was on, and Colonel Matson came up recently because he knew we were working on the same problem. But I think we have a certain amount of information which would be of use to Dr. Warth, information which is not yet published. You understand that, when you are working on a subject, the information which you have is always two or three years in advance of information which you have published.

53,193. I think you are wise?—You will discuss results with a colleague and give information of ideas and suggestions when you will not commit your institution to a written account which is going to be permanent and is going to be read probably fifty years afterwards.

53,194. Would not it be possible to make arrangements whereby information might be communicated confidentially before it has reached the stage of being published?—That would be very useful and, as a matter of fact, we are doing that at the present time with New Zealand, and arrangements are being made to do it with Australia.

53,195. Would you be prepared to consider making similar arrangements with India?—We should be delighted to do so. What we are doing in these two cases is that we gather all the information in our Library and Statistical Department which form a collecting pool for information. We are passing that on to the people in New Zealand and we are going to do the same thing with the people in Australia. On the other hand, they in return will communicate to us information which they have there which we may not have seen. Furthermore, we will communicate to them data, not in confidence in the usual sense of the term, but which is not yet published, bearing on the work we have already done, though it is not yet at the stage when we should publish it.

53,196. *Professor Gangulee*: What was the position of the animal nutrition research in this country prior to the establishment of the Rowett Institute?—Do you include in that question the Rowett Institute and the Institute at Cambridge?

53,197. Yes; what was the position in Great Britain as a whole before you set up these central institutions such as the Rowett Institute?—There was a certain amount of scattered unconnected work being done here and there, but in my opinion there was no continuity of effort, there was no team work; the work was not kept going as it has been during the last four or five years; there was not the continuous systematic investigation of a subject such as is going on now.

53,198. There were haphazard stock-feeding experiments here and there?—Yes, when a worker took it into his head that he would like to do something, he did it; but if he no longer wanted to do it, the work stopped. As a matter of fact the institution at Aberdeen, and I presume the one at Cambridge, was set up by the Development Commission for the express purpose of securing team work and continuity of investigations.

53,199. This central organisation has provided that continuity of research?—Yes, the institution with which I am connected has provided that continuity. There are investigations running to-day as strongly as on the day they began, although they are being carried on by different people; as workers drop out you put in other workers, but the investigation continues.

53,200. The principle you follow, as I understand from your evidence, is that the fundamental questions involved in animal nutrition research are dealt with in your central research station?—Yes.

53,201. Then, the practical possibilities of those results are being tested in various centres?—Yes.

53,202. Would you please explain how these tests are arranged?—Yes. The arrangement should be that any information we obtain at the institute, or which is obtained at any other similar institute, information which appears to be of pratical value, should be tested out under practical conditions on our experimental stock farm, and also, either at the same time or subsequently, there should be similar tests carried out in different parts of the country or in the Dominions and Colonies, by the people who work with us and carry out the same tests at various places. We have been doing that for the last four or five years and we have found it to be extraordinarily useful in so far as the tests are carried out under different environmental conditions. The tests are carried out by people who are looking for different results. If you have four or five people working at different centres, and the results all come out uniform, you are much more certain that it is right than if one person had done the same thing four consecutive times, because in the first case you have eliminated the personal factor.

53,203. How do you keep yourself in touch with these various centres to which you have just referred?—That arises more or less naturally, because research workers who are interested in a subject work together; they come to us at the institute or we go and see them; then we arrange that we will carry out certain tests. Then, in some instances, the Board of Agriculture, or the officials in Whitehall, arrange for a committee and a committee thus arises spontaneously.

53,204. When you said that the Institute carries on joint work with other institutions, are you referring to team work, not on these practical tests, but on fundamental research?—Fundamental research as well as practical tests.

53,205. When you start upon a problem, do you discuss it with these various institutions? For instance, if it is the problem of iodine deficiency, do you say: "Let Cambridge work out the physiological tests, we will work out bio-chemical aspects of the problem," and so on; do you divide up the work like that?—Yes. You refer to iodine; I think the possibility or the probability is that we shall be doing exactly what you have suggested just now through the Medical Research Council. I am a member of the Nutrition Committee of that Council; we have been working on the subject for four or five years and we have now reached the stage when we need team work on a fairly big scale involving scientific laboratories, chemists, medical officers of health and so on; I think arrangements for that team work will be made through the Medical Research Council.

53,206. So that you have now working together, under your general direction, the Rowett Institute, the Cambridge Nutritional Institution, the North Ireland Department of Agriculture, and Queen's University, Belfast?—Yes.

53,207. And various colleges of agriculture in Scotland and England. Do you meet together to discuss definite problems?—Yes; with regard to Cambridge University, Professor Wood, who is the head of the Nutrition Institute there, and I meet periodically; it is not an official meeting arranged

through the Minister of Agriculture or the Board of Agriculture; he is in Aberdeen about twice a year, and I am at Cambridge two or three times in the year, we meet and discuss what we are each doing and sometimes we exchange workers. Two of my workers have been working at Cambridge in his laboratories although they are paid on my pay list.

53,208. Is that done unofficially?—It is difficult to say whether it was done unofficially or not. That was the whole idea at the back of the Development Commission when they got this going; we have carried out that spirit and it works extraordinarily well. But we meet without notifying the Ministry of Agriculture or the Board of Agriculture that we are going to meet; but they know it is being done, and I take it they are satisfied that it is so.

53,209. Apart from that sort of meeting, which of course depends on the personnel of the organisations, you do not have any formal conferences where you discuss research problems and then allot work to various institutions?—Yes, we do; there is a committee consisting of Professor Wood of Cambridge, Dr. Crowther, Principal Wilson and myself, and we have recently incorporated Professor Scot-Robertson of Belfast. We act as a committee reviewing results which we have obtained, encouraging and giving assistance to colleges of agriculture that carry out like experiments. There is another committee, on poultry, which meets in the same way, in which all the colleges of agriculture in Scotland, the Agricultural Department of Northern Ireland and the Rowett Institute, meet together. That has been carrying on work for the last three or four years, and that committee is now being enlarged to include representatives from two of the institutions in England; so that we will have then a committee dealing with nutrition in poultry, having work carried out at all the big centres in the British Isles where nutrition of poultry is being studied. There will be official meetings.

53,210. Would you agree that these developments about which you have just told us are the results of the Development Commission?—The whole Institution is.

53,211. Such developments as correlating your investigations on poultry, for instance?—No, the Development Commission did not lay down any rules or regulations.

53,212. It is a sort of natural outcome of that?—A natural outcome of the institutions which have been formed.

53,213. *Sir Thomas Middleton*: What happened I think was this: at the Research Council we discussed the setting up of official committees for the purpose, and there was a tendency in some quarters to suggest that these formal committees should be constituted. Then we came to the conclusion that, on the whole, it was best to have informal committees of the type which Dr. Orr has just described and to allow them to meet when they required and to let us know at the Research Council what was happening. I think that is the present position?—That is the present position; we send up a report to the Research Council.

53,214. *Professor Gangulee*: Then I see you are in touch with the Empire Marketing Board for linking up all nutritional investigations. What arrangements have you come to with that Boad?—I had better tell you how that work arose. The Empire Marketing Board is a Board which has recently been constituted and I am not sure whether they have got a complete organisation or machinery for dealing with research; but, so far as we have any connection with the Empire Marketing Board, it arose in this way: an investigation had been carried out by one of those committees such as Sir Thomas has referred to: a committee of Professor Wood, Major Elliott and myself, which had accumulated a considerable amount of

information which seemed to have some practical value. I was asked to write a short memorandum on this investigation; that memorandum was considered by a sub-committee of the Civil Research Committee. That sub-committee consisted of various scientific experts; Sir Thomas Middleton was on it, Sir Robert Greig, Sir Daniel Hall, Sir Frederick Hopkins and people like that. They thought that this investigation looked promising, and the memorandum with the recommendation of this sub-committee of the Civil Research Committee was passed on to the Empire Marketing Board, who decided to extend the investigation to places in the Empire overseas, because application had been made to them by certain of the Dominions and Colonies to have this subject investigated. They then made a specific *ad hoc* grant to the Rowett Institute, asking us if we would undertake certain work in Africa. Then we found workers to undertake that work in Africa in junction with the Agricultural Department of the Colony concerned. We made an arrangement with them, we provided the workers and the direction of scientific investigation at the present stage rests with us. The practical application is being done in Africa; if it develops it will ultimately pass entirely into the hands of the local authority and we shall drop out, except in so far as they have established contact with us and can write for information, and we would hope they would send us any interesting results which they have arrived at which may be of value for other parts of the Empire.

53,215. So that all that work is financed by the Empire Marketing Board?—No, only that specific piece of work.

53,216. From the point of view of administration, Scotland is now independent of the Ministry of Agriculture, is it not?—Yes, it is independent.

53,217. You have your own Board of Agriculture?—Yes.

53,218. Then what is the existing link between England and Wales and Scotland in matters of research?—The Development Commission; that is a very important link, because I have nothing officially to do with the Ministry of Agriculture, nor has Professor Wood anything to do with the Board of Agriculture; our common meeting ground is the Development Commission.

53,219. Administratively, you are different?—Yes.

53,220. The common link has been provided by a central body like the Development Commission?—Yes, that is our meeting ground.

53,221. With regard to the administration of your own Institute, who constitute the governing body?—The governing body consists of four members appointed by the University Court, and four members appointed by the Governors of the North of Scotland College of Agriculture; but the governing body, having been constituted, is then not responsible either to the University or to the College of Agriculture; the governing body is responsible only to itself; it is an independent institution theoretically, but in fact it is, to a very large extent, dependent upon the good will of the Board of Agriculture under the Development Commission in so far as at the present stage of its existence it gets about nine-tenths of its money through that channel; so that, if they were displeased they might reduce our grant. Theoretically the whole power is in the hands of the governing body, but the body that gives the funds, as you know, has always the ultimate power.

53,222. But the Development Commissioners have no voice in the appointment of research workers of your institute?—No, research workers are appointed by the governing body.

53,223. And dismissed by the governing body?—Yes.

53,224. Have you any representative of the staff on that governing body?—No.

53,225. The staff is not represented in the governing body?—No, the staff has nothing to do with the governing body.

53,226. Have you a staff council to discuss question of research or administration?—At intervals of six weeks we have a meeting of heads of the departments, which forms a sort of local senate within the institute itself, and at other intervals of six weeks we have meetings of the whole of our staff for discussion of the scientific work; so that there is a meeting every three weeks. But these bodies do not discuss questions such as salaries, status of workers, administration, raising of funds or anything of that kind; they are concerned solely with domestic matters within the institute.

53,227. You are, of course, concerned with one side of animal husbandry, that is animal nutrition; there are two other aspects: animal breeding and animal disease?—Yes.

53,228. What are your relationships with those two branches of animal husbandry? Do you keep in touch with the veterinary people and breeders? —We do, but our link there is not so strong as with Cambridge, for this reason, that nutrition is a rather wide and difficult subject at the present time; it is one of extraordinary interest and one, I believe, of very great economic importance. Therefore, we are driving so hard along purely nutritional lines, in the hope of getting out results of an immediate practical value, that we have not had time to link up with breeding on the one hand and diseases on the other, except that we are considering, jointly with the research workers in genetics, the effects of mal-nutrition on sterility, in which we are intensely interested, and we are discussing with the veterinary people questions as to the effect of bad feeding upon the incidence of disease.

53,229. *Sir Thomas Middleton*: You have a Pathologist on your staff, as a matter of fact?—Yes.

53,230. *Mr. Calvert*: Your Institute, once it has received its grant from the Development Board, is financially independent?—As Director of the Institute, I understand so and act accordingly.

53,231. That is to say, your grant does not lapse on the 31st March?—No, our grants are yearly grants.

53,232. Any balance left over at the end of the year automatically is available to you and does not revert back to the Development Board?—Theoretically, at the present time it should revert back to the Treasury, but we are trying to get it arranged so that we get a grant of so much money for the institution, and the institution if it expends more than that sum will find the money for itself, so that if we have a surplus of £200 or £300 at the end of the year, we can carry it forward to the next year; or, if we are on a line of work which ought not to be held up for £100, we could go on working, even though we had a deficit of that amount, carrying over the deficit to next year in the hope of making it good next year.

53,233. Does this £12,000 on the experimental farm go straight to your credit?—Yes, we raise that money; no grants are made for the experimental stock farm.

53,234. Having got your money, are you subject to any control in the expenditure of that money?—You have raised a point that we are discussing at the present moment with the Board of Agriculture. From my point of view, the grant having been made, there should be no further control with regard to the expenditure of it until it has been expended and the accounts then submitted to the public departments; if then they find there have been irregularities, that we have used the money for some object other than that for which it was given, then they can withhold their grant

for the succeeding year; but obviously, in the administration of a grant for research work, the only people who can say whether they should spend £10 under this heading or £10 under that heading are the people who are doing the research and the local governing body.

53,235. Having got your grant, if you want to buy a microscope you can go out and buy it: you do not have to give several years' warning through a multitude of channels?—That is exactly what we do: having got our grant, we use the grant to the best advantage of the institute for developing its work; sometimes, in doing that, some of the officials have thought we had rather out-stepped our rights.

53,236. You, as Director, are allowed to concentrate on research and do not have your attention diverted by having to refer to volumes of account rules?—No, as a matter of fact, I do not bother about the accounting; I carry on with the research, as long as I know that the total funds available are not being exceeded; but probably I should pay attention to detailed rules and make quite certain that the amount of money on each sub-head of our estimates has not been over-spent and that the money on cleaning the place has not been under-spent. As a matter of fact, I pay little attention to that, but probably one should.

53,237. *Sir Thomas Middleton*: As a matter of fact, the estimates are presented in detail at the present time?—Yes, they are presented in detail.

53,238. *Mr. Calvert*: But you do not have what one research institute had: a question from the auditor wanting to know how it was that some cows calved once a year while some only calved once in two years?—To obviate that, I induced my governing body to accept full responsibility for the experimental farm, and to say: "We will do without any grant at all; if we expend beyond our available funds the governing body has got to find the money."

53,239. *Sir Thomas Middleton*: There is only one point which arises out of the questions which were put to you by Mr. Calvert; as a matter of fact, a great deal of administrative work is thrown on the Director of the Institution at the present time; is not that so?—Yes, about seventy-five per cent. of my time is devoted to that.

53,240. And you do feel that that is a very serious hindrance to your work?—I feel that the institution has got so big now that it is impossible for one man to have an efficient organisation that will keep us in direct contact with Cambridge, New Zealand, Africa and all these various places, and know sufficient about the work of all the different departments to be able to give general directions, and at the same time be in immediate contact with the details of the fundamental work.

53,241. In India, we are faced with a great shortage of scientific workers, and we frequently find that some of the senior scientific workers in charge of institutions are largely occupied with administrative work; that seems, to some of us at least, a waste of energy. Are there any suggestions which, from your own experience, you could make as to methods by which administrative work now falling on Directors could be dealt with by some process of devolution?—What I have done at the institute is to departmentalise into the department of physiology, the department of biochemistry and so on, and I have thrown as much of the internal administration work as I could on the heads of these departments, and as much work as possible of the outside administration on the Secretary of the Institution, and have concentrated my own efforts on the scientific administration.

53,242. The Secretary of the Institution is doing the work of an estate agent for the property now?—Yes, he is doing much more than that. The papers come in in the morning; I give the general direction as to the nature of the answers which may be given; he clears them away and does

all that. Furthermore, he carries all that information in his head. That has worked exceedingly well, except that the man we have had for that post, who has been with us for the past five years, has got the offer of another post at double the salary, and he is now leaving us. He was far too good a man for the salary we were offering him; we offered £350, and another body comes along and says: "We will pay you £650, rising to £850, with a pension"; and we lose him. I find that a great nuisance at the present time, because so much of that administrative work had devolved upon this very capable person.

53,243. *Mr. Noyce*: How often does your governing body meet?—My Finance Committee meets once a month.

53,244. And the whole governing body?—I am afraid at irregular intervals: possibly twice a year. They do not meet unless I ask the Secretary to arrange a meeting.

53,245. Then it is the Financial Committee that really does the important part of the work of the governing body?—The Finance Committee consists of the convenors of all the other sub-committees. One wants to make quite certain that the finance of an institution like this, disbursing £40,000 a year through its hands, is being efficiently controlled, by insisting on a monthly meeting. Any questions of policy which arise invariably involve finance, so that they must be discussed monthly; all convenors know what is being done. The Finance Committee is really the executive committee of the whole institution.

It is always the finance committee which is the most important in all governing bodies, is it not?

53,246. *Sir Thomas Middleton*: At one time the building committee was a very important one?—It was the most important one at one time.

(*The witness withdrew.*)

Major WALTER ELLIOT, M.P., M.C., D.Sc., Under Secretary of State for Scotland.

NOTE OF EVIDENCE.

I am at present Under-Secretary of State for Scotland which office includes Scottish agriculture. The Under-Secretary of State for Scotland and the Parliamentary Secretary to the Ministry of Agriculture (England) are *ex officio* members of the Empire Marketing Board. This organisation covers the whole Empire and the Home Governments, the Dominions, Colonies and Indian Empire are all represented on its Board. A grant of £1,000,000 per annum has been voted to it by the United Kingdom Parliament.

The Empire Marketing Board was founded as the result of the report of the Imperial Economic Committee. These reports stated that its main purposes should be publicity and research and definitely laid down that the research required would be not only applied but also fundamental. From its inception therefore the Empire Marketing Board has envisaged research as one of its primary responsibilities and has set up two main sub-committees, one on publicity, one on research, of which I am at present chairman.

The Research Committee works in every possible case through existing institutions and to emphasise this is called the Research Grants Committee. It has allocated in the first year about £600,000 for this purpose.

India is as closely concerned in the work of the Empire Marketing Board as any other part of the Empire, and her Government has the same right to submit problems and make application for grants to assist in their

solutions. No doubt many such problems are arising now both from the work of the Royal Commission and independently.

I should be glad to discuss these when giving evidence.

The policy of the Board with regard to research is, as I have said, to work through existing institutions, and await so far as possible bringing up of questions from them. There is, however, one line in which policy has been already set out. At the Imperial Conference the question of tropical and sub-tropical agriculture was considered, and approval was given to the policy of "a chain of research stations" running through the tropical and sub-tropical belt formed in the most part from present stations but with the addition of links where necessary. For this purpose the reconditioning of Amami Station was seen to be necessary, and it is possible that a further station to deal with soil problems and irrigation might be made, perhaps in the neighbourhood of the Nile and the Euphrates. These stations will be, by the nature of the case, mainly in the Crown Colonies, but one at least will probably be in a self-governing Dominion—Australia (Northern). It would be of much interest to discuss with the Commission the relation of certain Indian stations to this chain, and whether they would desire to come in.

Important discussions on this topic are now proceeding in the Colonial Governors' Conference at present sitting under the chairmanship of Mr. Amery. It has been suggested there that the research services throughout the Crown Colonies should be placed on a corps basis with free interchange over the whole area covered by the Governments joining the scheme. To this scheme the Empire Marketing Board has been asked to contribute and I have undertaken to submit for consideration any scheme outlined.

It seems possible that India might derive great advantage from co-operation with the scheme for a chain of stations.

Oral Evidence.

53,247. *The Chairman*: Major Elliot, you are Under-Secretary of State for Scotland?—Yes.

53,248. I have one or two questions to put to you on your note. Who represents the Indian Empire on the Empire Marketing Board?—Mr. Lindsay.

53,249. I see that India would be eligible for grants if submissions were put forward and approved. Have any such submissions been made?—Not so far as I know. I do not think anything has been put forward, possibly in view of possible suggestions by the Royal Commission.

53,250. Do not let us stand between India and your munificence! Can you give us any indications as to the circumstances in which such grants might be given to India, and on what conditions they would be made?—The best way to answer that is to give you an example in connection with one of the Dominions. In the case of Australia, there was an eminent Australian scientist visiting this country shortly after the formation of the Empire Marketing Board. He was put in touch with the Empire Marketing Board through the Australian representative on that body, Mr. McDougall. It was found there was one set of problems being investigated, problems connected with mineral contents of pasture (which Sir Thomas Middleton will remember), and it was found that this was of great interest to Australia. They therefore drew up a scheme which was put forward, through the Australian Council of Scientific and Industrial Research, to the Australian representative on the Empire Marketing Board, who laid it before the Board as a whole. It was investigated by the technical authorities. They thought it was sound, and the scheme was put through. It involved a grant of fifty-fifty by the Australian Council of Scientific and Industrial Research

and by the Empire Marketing Board. It also involved an interchange of staff. That interchange of staff is being organised now.

53,251. *Professor Gangulee*: Do you insist on the £ for £ basis always in the making of grants?—Not in every case. The Board work on the principle of local contributions, where such contributions are possible; although it recognises in certain instances that it may be of advantage for the Empire Marketing Board to bear the entire cost.

53,252. *The Chairman*: Are these grants made from year to year?—So far, they have been made on the basis of a three-year period or a five-year period, with a possibility of renewal, depending on the progress reports as they come in, and depending, of course, on the desire of the parties to continue the arrangement.

53,253. In the case of a grant to go towards the financing of a scheme of research in Australia, you depend upon the progress reports sent to you from Australia. You do not attain to the right of inspection?—No. That is the virtue of the £ for £ contribution. One expects that that would involve the Australian Council itself keeping a close eye upon the soundness of the work.

53,254. To what extent is the Empire Marketing Board in touch with the Committee of Civil Research?—As you know, the Committee of Civil Research consists of one person—the Prime Minister of the day, and anyone else whom he chooses to appoint on it. There is no standing Committee of Civil Research, so to speak. The Committee of Civil Research is also a purely advisory body; that is to say, the reports of any of its committees have no executive power. One of its committees having reported on a subject which the Cabinet thinks would be of interest and of importance to any of the ends for which the Empire Marketing Board was set up, the Cabinet transmits that report to the Dominions Secretary, who is the Chairman of the Board, with the recommendation that action should be taken on it. In practice, both Committees rely very largely on advice from the same scientific people. The scientific man who investigates a problem under the Committee of Civil Research is in informal touch with all of his colleagues who are working on that and similar problems.

53,255. The Empire Marketing Board has financed certain schemes in this country, has it not?—Yes, schemes which are of more particular interest to this country, and schemes which are considered to be of fundamental importance throughout the Empire. In general, it has sought only to finance schemes which can be considered to have a general bearing on problems which are likely to be of advantage to the whole Empire, and most of the schemes, I think, which it has financed in this country are schemes which, it was considered, would be of general advantage. Take its entomological work, for instance. It has given considerable appropriations for entomology. Although located in this country, those efforts would serve as bases for work overseas: for instance, the work on the collection of beneficial parasites. These, although bred in this country, would be used overseas.

53,256. Is the Empire Marketing Board in touch with the Development Commission?—Yes. It is closely in touch with the Development Commission. The Development Commission is the body to which it submits schemes brought forward for work in this country. It submits them to the Development Commission for technical opinion as to their suitability. It is the "appropriate organisation."

53,257. But the grants, if made, come out of the Empire Marketing Board Fund?—Yes, but we work through existing institutions, and the Development Commission is the appropriate existing institution in the case of this country, as in Australia it is the Australian Council of Scientific and Industrial Research.

Major Walter Elliot.

53,258. Have you formed the view that the principle of which the Development Commission in this country is an illustration is a sound principle?—To what exactly do you refer?

53,259. I refer to the principle according to which a body, not directly responsible to Parliament, should be in the position of recommending disbursements from a non-lapsing fund?—Yes, I think that principle is sound.

53,260. It does afford reasonable continuity for research. Is that an advantage?—I think that is absolutely essential. There is absolutely nothing in the world which so completely stultifies research as uncertainty, I will not say from year to year but from quinquennium to quinquennium, as to whether a certain series of investigations can be pursued or not. The Development Commission affords the element of continuity. It also, of course, affords another excellent principle, which is the principle of co-ordination between States. Scotland has complete autonomy in agricultural matters, and the fact of two autonomous bodies existing side by side, the Scottish Agricultural Department responsible to the Secretary of State for Scotland and the English Agricultural Department responsible to the Minister for Agriculture, seems to me demands the institution of some such co-ordinating body; otherwise you would have both sides fighting independent battles with Nature and with the Treasury, and both are very awkward antagonists.

53,261. So far it has not been observed that the grant of funds from the Development Fund for Scottish purposes has outraged Scottish national feeling?—I should say that they have found it quite possible to swallow the insult. In fact, in some cases it has led to a larger proportion being spent in Scotland than would have been spent under the strict revenue allocation of eleven-eightieths. We should view with grave apprehension an attempt to destroy this proposal. Science does not know a national frontier. In the case of fisheries, fisheries occupies a much larger proportion of Scottish national economy than in England. Yet, if the two countries were to be allocated on a strictly revenue basis, you would find that a much smaller proportion of the funds would be spent in Scotland than is spent at the present time.

53,262. You mention in your note that it has been suggested that the Research Services throughout the Crown Colonies should be placed on a corps basis, with free interchange over the whole area covered by the Governments joining the scheme. Has anyone suggested that the Dominions might join in that?—No. That has not yet been mooted, and I think it would be a difficult, certainly a ticklish question. I should not like to express any opinion upon it at the moment. The Dominions, of course, would be able to borrow men from that scheme under their own arrangements; but whether or not a corps service, predominantly under the administration here, should be extended to the self-governing Dominions would raise some awkward questions.

53,263. I am sure it would. On the other hand, if you have a great Colonial corps organised as a Service, with pay and prospects, including pensions, which can necessarily only attach to the membership of a large Service, it might make it very difficult for the Dominions to hold their own young scientists or to find, in the open market, others willing to serve them unless they were prepared to offer the same conditions of pay and prospects as was afforded by the corps to which you have made reference?—That is so, and the second of those would be the more difficult. They could, with relative ease, offer the same prospects of pay, but the same prospects of scientific work they would find it very difficult to offer a young scientist. With the range of the whole Colonial Empire (an enormously developing area) a man would have a chance of scientific research and work which I do not think could be excelled, and I do not believe could be equalled, by any service in the world.

53,264. So that, although you are not prepared to commit yourself to-day as to the possibility of including research workers from the Dominions in the scheme, you do not altogether close your mind to such a possibility?—I prefer to leave it entirely to the judgment of the Dominions concerned.

53,265. There is no reason why individual research workers from the Dominions should not enlist as members of the corps?—None.

53,266. In fact you expect they will?—I hope we will be able to draw scientists from the Dominions as well as from home. The other point with regard to the Dominions is that there are only two of the Dominions which are specially concerned with the tropical and sub-tropical areas. Therefore their interest, although great, is not so immediate. A Canadian scientist, naturally, would be more attracted by work on the North American Continent. There is a certain proportion of Australia in the tropical zone, but not a large proportion, and it is not heavily inhabited. There is a certain proportion of the Union of South Africa in the tropical and sub-tropical zone, but again the major portion lies outside of that. The relation of a great sub-continent such as India to a scheme such as this would need to be considered separately from the relation of the great Dominions laying wholly (like New Zealand) or largely (like Australia) outside that zone.

53,267. A large part of India does lie north of the tropics?—Yes. Speaking without the book however, I should say that there is a larger proportion of people in India within the tropical and sub-tropical zone than in any other self-governing portion of the Empire.

53,268. I see you contemplate a chain of stations, one of which would be a self-governing Dominion, namely, Northern Australia. Is there any reason why one station of that chain should not be in India?—I can see no reason why not; in fact, I should think it would be greatly to the advantage both of the chain of stations and to India that one or more links of that chain should be within its area.

53,269. *Sir Henry Lawrence*: You mention that the objects of the Empire Marketing Board include research. What else are the principal objects of the Empire Marketing Board?—Research and publicity were the two functions which were contemplated for it by the Imperial Economic Committee.

53,270. Is it part of their work to watch the channels of trade?—It is only, of course, just beginning its work, but one of its objects is to improve the trading facilities, so to speak, within the Empire by biological research or economic research, or, if necessary, by calling public attention to the matter.

53,271. Would it be in any way opposed to their purposes to encourage inter-Imperial trade at the expense of foreign trade, external to the Empire?—It was with the purpose of encouraging inter-Imperial trade that it was set up. It could not properly spend money on encouraging trade with countries outside the Empire. That would not fall within the limits of its fund. It could not take that into account at all.

53,272. Then it would be part of their object to investigate and observe the channels in which trade within the Empire is proceeding?—Absolutely.

53,273. You mention that there is a representative of the Indian Empire on this Board in Mr. Lindsay, the Trade Commissioner. Mr. Lindsay, as Trade Commissioner, is concerned only with exports from India and not with imports into India. Is not that so?—The Indian Government allocates to him his duties. No doubt that is so. He is on the Board as a representative of the Indian Empire. It is immaterial from our point of view what the particular duties are with which he is associated with the Indian Empire.

53,274. In his recent report on Indian trades, he very carefully pointed out that it was no concern of his what imports from England or from the rest of

the Empire went into India. But that would be a portion of his duties as a member of your Empire Marketing Board?—Yes. We should hope that the reciprocal current would not be entirely ruled out of his mind. I think Mr. McDougall, the Australian representative, certainly does keep in mind both the movement of goods from Australia to this country and the movements of goods from this country to Australia. One of the schemes in which the Empire Marketing Board is particularly interested, and which was recommended to it by the Imperial Economic Committee, was the export of pedigree cattle from this country to various parts of the Empire.

53,275. *The Chairman*: Sir Henry Lawrence is anxious to know whether the Australian representative concerns himself with trade between Australia and Canada?—The Board has an enormous field to cover and, at present, owing simply to the question of what is physically possible, we have been dealing mostly with the big run of trade between the United Kingdom and Overseas and between Overseas and the United Kingdom. So far we have not got to the problem of inter-Imperial trade.

53,276. *Sir Henry Lawrence*: Would your Board investigate such questions as complaints of unfair competition? I am thinking particularly of a recent Inquiry which has been held in India in regard to the unfair competition of Japanese imports of cotton piece goods into India as affecting Lancashire piece goods into India?—So far we have not turned our attention to those questions, and I think, as a matter of fact, it would be a considerable time before we could get round to questions such as these. As one knows, these questions involve very contentious Party problems of one kind or another, and even in the case of Great Britain we would have to walk very warily if we began to make recommendations about importation into this country of goods from Overseas Dominions or from foreign countries. We need to be very sure of our ground. In all these cases the matter would need to be covered, as a preliminary, by a very thorough study of the subject by the Dominion or by the territory actually concerned.

53,277. Eighteen months ago, in Australia, they passed a Safeguarding of Industries Act, directed particularly against unfair competition from Japan owing to the depreciation of Japan's currency. Would that problem come before the Empire Marketing Board?—I should think we should consider that more a domestic affair of the part of the Empire particularly concerned. It would be impossible to set up any sort of super-State organisation in London, and it would be very strongly resented by the self-governing Dominions to investigate any of these problems. None of these problems could even be raised except at the suggestion of the country concerned.

53,278. You would make no suggestion on that matter to any country?—No.

53,279. While the Australian Government was taking that action in regard to this particular competition, in India no such machinery existed for safeguarding India against exactly the same competition against which Australia was safeguarding herself. Would it be any part of the duty of your Board to point that out to the Government of India in the interests of the Lancashire trade in England?—No. It certainly would not be in the function of the Board, as I understand it, to make any suggestion of that kind.

53,280. I only wish to point out that Mr. Lindsay has said, in his capacity as Trade Commissioner, that he is definitely not concerned with this competition between Lancashire trade and Japanese trade?—True. In all of these cases one has to leave the matter to the Government directly concerned. Any recommendation to one Government of the Empire by another Government of the Empire is a matter which, so far, the Board has shown itself very chary of embarking upon.

53,281. Is your Secretary Sir David Chadwick?—He is the Secretary of the Imperial Economic Committee, which is, so to speak, the Standing Conference of the High Commissioners or representatives of the various parts of the Empire. The Empire Marketing Board is the executive committee, which, for technical purposes, is under the Secretary of State for the Dominions, and its Secretary is Mr. Stephen Tallents.

53,282. The other is the Empire Economic Conference, is it?—The Imperial Economic Committee. I am afraid there is a great number of these committees, and, as Mr. Balfour said long ago, one needs a special kind of brain to realise the relations of all these things, but it is really of this nature: The Imperial Economic Committee is an association of the representatives of the various Dominions and territories. It reports right back to the respective Prime Ministers. It recommended that a body should be set up to carry out various recommendations which it made. This body was set up, as it could only be set up, by the British Parliament, and this body (although the representatives of the Dominion sit on it) is yet technically a bodily part of the British United Kingdom governmental institutions. The other is not.

53,283. Do you know if there is any representative of India on the Imperial Economic Committee?—I think Mr. Lindsay is the representative on that too. I cannot be sure off-hand. I am sure there is a representative of India on it.

53,284. *Professor Gangulee*: The High Commissioner sits on that Committee?—Yes, or his representative.

53,285. *Sir Thomas Middleton*: In connection with the chain of research stations, you suggest the possibility of one of them dealing with soil problems being set up in the neighbourhood of the Nile. Is this at present merely a suggestion, or has any action been taken?—No action has been taken. It is merely a suggestion of a very tentative kind. The question of a station somewhere in the Near East has been discussed more than once, and it is possible that such a station, if set up, would have a great interest in soil and irrigation problems. I have simply brought these two suggestions together. They are being canvassed just now. No executive action, or indeed no preliminary investigation of any kind, has been undertaken.

53,286. So that it is possible we might keep in mind such an Indian province as the Punjab, which has about four times the irrigated area of Egypt? —Undoubtedly.

53,287. What is the specific work which is being allocated amongst these stations?—The Amani Station is in process of reconditioning just now, and the Director is out at present making his survey on the spot. He will report later on when he comes back as to what particular work he thinks his station can most usefully specialise upon.

53,288. Has any definite arrangement been made for cinchona work there? —It has been recommended. One of the sub-committees of the Committee of Civil Research went into that question, and they recommended that that work should be done at Amani; but it was merely a recommendation for the consideration of the Director.

53,289. You have indicated that difficulties might arise over extending the plan for a corps of workers to the Dominions, but if one of the stations in the proposed chain of stations is located in Northern Australia, for instance, would that station not be likely to draw upon the corps for its staff?—The matter is in an absolutely unsettled stage so far. We are merely working these things out side by side as we go along. I should say that members of the corps would undoubtedly be, from time to time, at the station in Australia, and similarly that the workers from the Australian station

would find themselves from time to time at the other stations within the Empire. What the relations would be I do not know, but it seems to be more probable that they would be seconded from the Australian station to the Colonial service and from the Colonial service to the Australian station, than that they should be simply interchangeable.

53,290. In connection with this corps, is there an idea of having a pool of workers who will be available for going to any part of the Empire?—Undoubtedly. The corps would be recruited on a basis of service within the whole area, and the corps workers would pass from one place to another at the direction of the central body.

53,291. You would have men available to take up work during leave periods?—We hope so. These matters are discussed at some length in the report of the Lovat Committee. The progress being made at present is so rapid that almost every month brings something new. The project has advanced enormously even since I wrote this note of evidence. I say here "Important discussions on this topic are now proceeding in the Colonial Governors' Conference." The Colonial Governors' Conference has actually agreed to recommend that such a scheme should be set up. I think one may say there has been more advance made in the organisation of agricultural scientific research, in the widest sense, throughout the Empire as a whole in the last year than there has been made in the 50 years that have preceded it.

53,292. In connection with these discussions, has the question of the difficulty of getting suitable workers been prominent? Do you expect to have great difficulty in recruiting your corps in the early stages?—That is a matter on which, I am afraid, one could not speak definitely until one saw the prospects which are open to the corps.

53,293. The difficulty is to ascertain the number of appointments which are likely to be made within a given number of years. That is a great difficulty from the University teacher's point of view?—Yes, but this corps envisages an organising directing Council sitting in London, which body will be able to form an estimate with a good deal more security than could be done by a series of scattered Governments.

53,294. But although they may be able to do better than scattered Governments, they will still have very great difficulty in forecasting the demand?—They will, but if the chain of stations and the pool of workers come into action, they will act as compensating factors. They will be able to draw on them, and, if people become redundant, to return them to the pool or return them to work on the chain of research stations. You will have the possibility of a steady flow of work and of workers, which will obviate a good many of the difficulties which we have just now.

53,295. With regard to India, I take it the class of problem which you would be prepared to aid would be either a question which would throw light on some general Empire problem, such as the one you instanced of mineral content of pasture, or something which affected Indian exports mainly to this country or to the Empire. Would you take into account questions which were purely domestic and for the benefit of India herself?—One would have some difficulty in that, because if each part of the Empire were to make application in regard to problems which were peculiar to itself then there is no doubt that the fund would very rapidly be dissipated. Suppose the United Kingdom were to make application to the Empire Marketing Board for an investigation specially connected with people living in congested districts under industrial conditons: a great sum could be spent on that, but it would be ruled out, in all probability, because of its lack of use to the Empire as a whole. Similarly, if India made application dealing with the great problem which arose out of the special difficulties of her religions with regard to food, we would need to rule that out also.

On such problems an enormous amount of money could be spent without getting the general interests very much further forward.

53,296. You remember that when, some time ago, our Questionnaire was addressed to India on this subject of the mineral content of pasture, the replies were very indefinite indeed?—Yes. Indeed they were rather negative.

53,297. The Questionnaire set one or two men in India to work to investigate the question, and they have gained definite information pointing to deficiencies in certain areas. We do not want to wait for the Report of this Commission before getting money for these men. There are certain workers who would be able to make good use of funds from the Empire Marketing Board in connection with this particular subject. The question is: how can those men get into touch with you? Must they do so through their own Governments (the Provincial Government or the Imperial Government, as the case may be) or may they send in their applications direct?—I am afraid they need to proceed through their Governments. I think the application would need to go from an institution to its Provincial Government, with a request for expedition. It could be forwarded direct from there to the Trade Commissioner with a request to lay it before the Empire Marketing Board. If an institution in Australia wished for a grant, it would need to come through the Australian Council of Scientific and Industrial Research. We cannot take account of individual applications from individual workers.

53,298. The position, in one respect, is the same as it is in the case of the Development Commission in this country. We do not deal with applications from individuals. On the other hand, any unofficial association in this country may send in an application to the Development Commission?—Yes.

53,299. In that case we must refer to the Government Department?—In the same way, if anybody sent in an application to us we would have to refer it to the Government concerned, and, therefore, if that could be done first it would accelerate the matter.

53,300. It would be, from your point of view, a very great advantage to have some recognised body in India who could deal with such applications?—Undoubtedly. That is one of the great advantages which we hope to obtain from the proposed Colonial Committee. It will act as a filtering body for these various applications.

53,301. *Professor Gangulee*: I do not quite follow the answer which you made to the Chairman with regard to the relation of your Board with the Development Commission?—The Board has the whole British Commonwealth of Nations as its province, and in each of those areas if an institution exists which surveys the problem of that country as a whole we deal with that body. The Development Commission is such an institution for this country. It surveys the problem of agriculture as a whole in this country, and therefore it is the institution with which we deal. If it did not exist we would have to deal directly with the Departments of Agriculture for the two countries concerned.

53,302. In Australia you deal with the Council of Research?—Yes.

53,303. And with the Colonial Governments?—At present we are dealing directly with the Colonial Governments through the Colonial Office, but if this Colonial Committee is set up then we shall deal with that.

53,304. In India we have no such central authority to which you can refer?—As far as I know, when we sent out the Questionnaire I think it went to the Simla Government.

53,305. *Sir Thomas Middleton*: That is the Government of India, and they distributed it?—Certainly we did not get an answer back from the Provincial Governments. We got an answer back direct from the Government of India. As far as I know, there is no body in India with which we

could deal which is analogous to the Australian Council of Scientific and Industrial Research.

53,306. *Professor Gangulee*: Is this Empire Marketing Board a permanent institution?—We hope so, but it is set up at the will of Parliament, and it may similarly be abolished at the will of Parliament, but in its constitution it is a permanent body.

53,307. Are you, then, able to give grants on a basis of three or five or ten years?—So far, with regard to the grants which we have given, we have enough funds in reserve just now to pay off those grants even if the Board were brought to an end to-morrow. That is one point I should like to make—that our allocation covers not merely the current year but a period of some years ahead during which the allocations run. But the same problem arises in all Government departments. As a matter of fact one finds in practice that an allocation is made continually year after year, although theoretically it may be discontinued in any one year by a vote in Parliament.

53,308. You do not invite any contribution from the rest of the Empire to this fund?—No. In making a specific grant, we generally do our best to see that a contribution is made *ad hoc* towards the solution of a particular problem, but no general contribution is asked for from the rest of the Empire.

53,309. With regard to the Research Grants Committee of your Board, does that Committee suggest problems or only consider such problems as are put up to them?—They consider the making of a grant towards the investigation of a particular research problem as it comes to them. This is one of the sub-committees of the Empire Marketing Board, and it is a lay committee. Therefore it calls for the opinion of the most eminent scientific authorities it can get, and they act as a jury weighing up the priority between the various problems which are put forward to them.

53,310 You do not suggest any problem? If there is a problem in connection with soil and irrigation which ought to be gone into, you do not make the suggestion to the Governments concerned?—We circulate that suggestion to the Empire if it has been brought up by somebody who, we think, has sufficient weight. As a matter of fact, we have sent out a Questionnaire to the whole Empire on the question of soil and irrigation, for instance, following on a memorandum written for us by Mr. Keen of Rothamsted.

53,311. In writing that memorandum, did you receive much assistance from the Government of India?—No, not in writing the first memorandum. We hope to receive assistance from the Government of India in reply to the questions attached to the Questionnaire. We sent out the memorandum, which was prepared at the Rothamsted Institute in this country, saying: "This is how it appears to an eminent scientific worker in England. We shall be glad of the views of the Empire, we shall be glad of the views of your Government, on the problem as it appears to you, and to clarify the discussion, we suggest further questions we should like answered."

53,312. The object of this Research Grants Committee is to make the fullest use of the research equipment of the Empire as a whole?—Yes.

53,313. You think India can get into this chain of stations which has been suggested by the recent Colonial Conference?—I think so, undoubtedly. I think enormous opportunities for scientific investigation exist in India, and a great mass of scientific equipment for the attacking of these problems. We have found, all over the Empire, that people working in a particular compartment not only can help themselves but can help other people, if they can be got to look over the walls of their compartment and to consider the question from the point of view of the world as a whole.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m., on Thursday,* 16*th June,* 1927.

Thursday, June 16th, 1927.
LONDON.

Present:

The Marquess of Linlithgow, D.L. (*Chairman*).

Sir Henry Staveley Lawrence, K.C.S.I., I.C.S.	Mr. H. Calvert, C.I.E., I.C.S.
Sir Thomas Middleton, K.B.E., C.B.	Professor N. Gangulee.
Rai Bahadur Sir Ganga Ram, Kt., C.I.E., M.V.O.	Dr. L. K. Hyder.
Sir James Mackenna, Kt., C.I.E., I.C.S.	Mr. F. Noyce, C.S.I., C.B.E. I.C.S.

Mr. J. A. Madan, I.C.S.
Mr. F. W. H. Smith } *Joint Secretaries.*

Dr. E. J. BUTLER, C.I.E., D.Sc., M.B., F.R.S., Imperial Bureau of Mycology, Kew, Surrey.

Replies to the Questionnaire.

The Position and Future of Pusa.

Question 1.—Research.—I find I have already said nearly all I wish to say as to the position and aims of the Agricultural Research Institute, Pusa, in a note submitted to the Public Services Commission, presided over by Lord Islington in 1914 and printed in the Appendices to their Report. I attach a copy of this note for ready reference.*

I am informed that Pusa is not now adequately fulfilling the functions outlined in this note, though I do not think that serious criticism of its work (beyond such, often salutary, as is the fate of all institutions of the kind) was offered up to at least the end of the War. I have no personal experience of the justice of recent criticisms, though it has appeared that the output of research work has somewhat diminished. This is readily accounted for, if true, by (1) the reduction in the scientific staff at Pusa (e.g., there is now only one Mycologist, instead of three in 1920, one Economic Botanist instead of two, and so on); (2) the increased decentralization resulting from the greater autonomy of the Provinces, which tends to make them less inclined than formerly to refer their problems to Pusa; and (3) the disheartening effect of uncertainty as to the future of the institution, threatened as it has been by successive waves of economy.

There is little or no educated scientific opinion in India, English or Indian, amongst those in a position to secure continuity of scientific effort. Pusa has alternately been the spoilt child and the Cinderella of Government

* *See Appendix in next page.*

institutions. Its real functions have never been clearly grasped by the majority of the people of influence in India who have any interest in its existence, and its geographical isolation has prevented any but a very few from having a first-hand knowledge of the nature of the work carried on there. There has never been an educated public opinion ready to take up arms in its defence, such as might be expected in England in similar cases should, for instance, one of the larger research institutions in this country be threatened. The higher research staff is largely English, and must remain so for a considerable period if the institute is to do its work properly, and this is not likely to help in popularizing its continued existence as a Government institution. But no one interested in the progress of agricultural science—and that, in the long run, means the progress of agriculture itself—can have any doubt as to the necessity for its continued existence in some shape or form as an agricultural research institution, and the proposal that I have made that it should cease to be a Government institute is, in my opinion, the best way of securing its future.

By ceasing to be a Government institute, I do not mean that it should cease to receive Government support. There are many instances of State-aided institutions in the Empire whose control is in the hands of public bodies composed in considerable part of non-officials. The Commonwealth Institute of Science and Industry in Australia has recently passed under the control of such a body, whose Chairman is, I understand, at present in England. On his Council some, at least, of the members give only part of their time to the duties of administering the funds placed at their disposal by Government. The time may not have come yet to set up a similar Council in India, but that need not prevent the application of the same principle to the administration of Pusa.

It would be the duty of the suggested body to make itself familiar with the aims and methods of the work in progress at the Agricultural Research Institute. The corporate membership would change less often than the few persons who at present control its destiny. Such a permanent body would be, if the members were properly selected, in a far better position than the Government officials at present responsible for the future of Pusa to secure continuity in its work and the provision of an adequate staff in carrying it out.

QUESTION 13.—*Crop protection, internal and external.*—(1) The existing measures for the protection of Indian crops against the introduction of foreign pests and diseases are, I consider, on the right lines. Their efficacy depends on the alertness of the Government Entomologists and Mycologists throughout India in discerning the existence of threatened dangers in other parts of the world that might be introduced, and in applying the existing facilities as rapidly as possible in order to keep them out.

(2) Internal measures against infection have been applied in certain Provinces, notably in Madras, against cotton posts and palm diseases. The principle might be extended as occasion requires.

APPENDIX.

NOTE ON THE POSITION OF PUSA IN THE AGRICULTURAL DEPARTMENT.

When the establishment of a Central Agricultural Station for India at Pusa was first proposed, there was little provision for technical agricultural education in India. Bombay alone had an Agricultural College, with a three-years' course. There were agricultural schools at Cawnpore and Nagpur with a course of two years. In Madras and Bengal agricultural

colleges were very inefficient and were shortly after condemned. It was natural, therefore, that education should bulk large in the original Pusa scheme; there was to be a two-years' course of elementary instruction in agriculture, followed by a third year to train men for employment in the department as farm overseers and the like, and, finally, selected students were to continue for a fourth and fifth year to qualify for higher subordinate posts, scientific assistantships in the department and private employment as managers of estates.

Concurrent with education, it was always understood that Pusa was to serve as a centre for scientific research. This was, indeed, the avowed purpose of the munificent donation of £30,000 placed at the disposal of the Government of India by Mr. Henry Phipps in 1903, which served as the nucleus of the funds out of which the Institute was constructed.

Whether the primary function was to be education or research does not appear to have been definitely decided by Government up to, at any rate, 1905. In that year the head of the department gave expression to a view which was becoming widely held by Directors of Agriculture in the Provinces and by the expert staff of the department, namely, that research was the main object to be held in view at Pusa; impressed by the danger of development into a teaching institution only and the swamping effects on the energies of the staff of a large influx of students, he proposed the abandonment of the lower courses, and the provision of well equipped agricultural colleges in the Provinces, leading up to a post-graduate course at Pusa. As a consequence, elementary agricultural education was never undertaken at Pusa; had it been, it is certain that it would have failed to meet the very diverse requirements of the rest of India, and proposals for the foundation of the provincial colleges would not have been long delayed.

The attention which was directed to the teaching function of Pusa in the early days of the scheme, left an impression on the minds of Government and of the general public which was not soon effaced. Thus Lord Curzon in his speech at the ceremony of laying the foundation stone on the 1st of April, 1905, looked forward to the prospect, in 50 years' time, of finding Pusa the centre of a great organisation, with ramifications extending to all parts of the Indian Continent, training a series of Indian students to devote their acquired knowledge to the practical pursuit of agriculture. In 1910, Mr. (now Sir) R. N. Mukerji, President of the All-India Industrial Conference, referred to Pusa as a technical college, making no mention of its research function, and expressed the gravest misgivings as to the amount of direct good, in proportion to the money expended, to be derived from the training of the sons of the middle classes, with either no land or no capital, for a career as practical cultivators as opposed to their traditional occupation as clerks and the like.

Nothing could be more striking than the contrast between these views and the opinions held and repeatedly expressed by the Agricultural Department itself, throughout India, as to the proper functions of the Pusa Institute. The Department maintains that the primary objects of Pusa are to conduct research into the fundamental principles of Indian agriculture, and to serve as a centre for such investigations in the agricultural sciences, chemistry, botany, entomology, mycology and bacteriology, as cannot, either from their magnitude or the extent of their application to India as a whole, well be undertaken by provincial departments.

The Board of Agriculture in 1906 stated that the research work at Pusa should be distinctly imperial in character, involving the application of the principles of each science to broad general problems of Indian agriculture, and that investigations of local importance only should not, as a rule, be undertaken. In 1908 the Board considered the teaching functions of Pusa, and recommended that the class of instruction provided should be

a post-graduate course for students who have already obtained a degree at a provincial agricultural college and, exceptionally, to other science students likely to derive real advantage from the course; the courses should be specially framed for (*a*) students who will afterwards discharge the duties of assistants to provincial experts in agriculture, agricultural chemistry and, in particular, in economic botany, mycology and entomology, and (*b*) students sent for special purposes. Again in 1909 the Board expressed the opinion that the aim of the higher teaching at Pusa should be to produce a class of men who would be able to carry out original investigations themselves, and also be qualified for teaching or specialised work in the Provinces. At the same time the Board recognised that it is impossible to separate the research work and the training to be given at Pusa, the two are intimately connected, and the training that the staff can undertake depends on the class of work being done in the laboratories and experimental fields at Pusa.

Hence research and the encouragement of research are considered by the department to be the chief functions of Pusa. The provision of practical agricultural education has been relegated to the provincial departments, and there is no doubt as to the wisdom of this course. The organisation is developing, though of course very modestly, on the lines of the United States' Department of Agriculture at Washington. Just as in the United States it has been found advisable at times for the Washington Department to undertake, or to co-operate in, demonstration work or large campaigns (as in work against the cotton boll weevil) in individual States, so in India Pusa has co-operated in the work of individual Provinces in such matters as the suppression of cotton boll worm in the Punjab and palm disease in Madras.

As to the need in India of research work of the type which Pusa is designed to supply, it is impossible to be too emphatic. The general level of crop production in India is low, and the quality of the produce often inferior. Crop improvement, both in quality and yield, in such staple crops as wheat, tobacco, oil seeds, fibres, pulses, is one of the primary requirements in the development of the agricultural industry, and may be most readily obtained by the application of modern methods of plant breeding, an exceedingly laborious and time-absorbing pursuit. An understanding of the chemistry and physics of tropical soils in their relation to availability of the plant food contained in them, to the water requirements of crops, to the deleterious alkali salts sometimes present in them, and such matters, is greatly needed. Then, there is the very large subject of the bacteriological activity in tropical soils, to which we look to solve many of the problems concerned with the proper use of manures and irrigation water, and to explain some at least of the apparent paradoxes in the growth of such crops as rice. A subject which requires very considerable facilities in regard to staff, time and equipment is the investigation of the various insect pests and fungus diseases which do enormous damage to the agricultural produce of the country. To co-ordinate all this work with agricultural practice, to conduct permanent experiments on the effect of different methods of cropping on the land, to test and improve agricultural improvements, and to experiment with a view to the improvement of agricultural stock, are essential features of a well-equipped agricultural research station. These are some of the lines on which the work at Pusa is developing, and which are necessary foundations for any considered scheme for the permanent raising of Indian agriculture to a level with that of other countries. It may be said, with some show of truth, that it would be impossible, in the present state of our knowledge, to write an elementary text book of Indian agriculture, similar to those of which there is a plentiful supply in Europe, which would not soon be shown to contain glaring misstatements of fact in regard to crop physiology

and similar fundamental matters as applied to India. The demand which is coming from the provincial colleges for further information before the teaching of even elementary agriculture can be satisfactorily carried out, is thus easily comprehensible.

Research of the nature referred to as being the most pressing need of the department should be as free and unfettered as possible. Any considerable deflection of the energies of the research staff to teaching would most seriously hamper its efficiency. This argument does not apply with the same force to the training of research students, and there are compensating advantages in having such students. The syllabus of studies in the prospectus of the Pusa College makes provision for research training in the scientific sections of the Institute, and I attach a statement* of the students who have undergone higher or special training at Pusa. On the whole, the material has been unsatisfactory in so far as it is intended to turn out men capable of independent research. For scientific assistants, working under the guidance of officers of the department, the results have been better and a number of useful assistants have been trained. Whether there is any real demand for research training in science as applied to agriculture, outside of the limited prospect which it opens for Government employment, is doubtful; there is, indeed, no evidence whatever of such a demand at present. It would seem as if we must be content to confine our energies largely to training men for employment in the various agricultural departments until such time as the prospect of private employment improves or there is an influx of students willing to pursue knowledge for its own sake.

Oral Evidence.

53,314. *The Chairman*: Dr. Butler, you are now at the Imperial Bureau of Mycology at Kew?—Yes.

53,315. You were at one time Mycologist at Pusa, were you not, and Joint Director of the Pusa Institute?—Yes. Before that I was Acting-Director for about two and a half to three years.

53,316. At Pusa?—Yes.

53,317. Was all your Indian service at Pusa?—No. I was first in Calcutta attached to the Botanical Survey of India at the Botanic Gardens. Then I was transferred to the Agricultural Department at Dehra Dun. I was the second technical member appointed to the Agricultural Department in India, and before any definite organisation was decided on, I was attached to Dehra Dun for four years, mainly because the Agricultural Chemist—the only officer existing at the time I was appointed—was already stationed there. That was before Pusa was ever thought of.

53,318. We have had your note of evidence. Would you like to add anything to it at this stage?—No, except that I should like to make it clear that I do not share in the view that Pusa is not now adequately fulfilling the function outlined in my previous note. I have no information of that; it may possibly be true, or it may not be true. I have no way, really, of knowing that short of a visit to India, but I have noticed that there is not quite the same volume of research work coming out.

53,319. *Mr. Noyce*: How long is it since you left India?—I left India in 1920, seven years ago.

53,320. *Professor Gangulee*: You talk about the volume of research work; can you tell us the quality of the research work?—The quality also seems to me to be rather less. It is difficult for me to judge on these matters without seeing the work of the institute.

* Not reprinted.

53,321. *The Chairman*: I gather that you are not in a position to form any further view one way or the other?—That is so

53,322. You have, I think, given considerable thought to the problem of the future of central research stations, and of Pusa in particular, in India, and also to their management and to the possibility of what I may call de-officialising that management, and to the relation which such central research stations should bear to provincial research stations?—Yes.

53,323. You have given us an outline of your views on that matter, but will you deal with it with more particularity than you have dealt with it in your note. Can you tell us, exactly, what form of semi-official body you are thinking of as the Board of Management of Pusa?—There has recently been a good deal of consideration given in the Colonial Office to the organisation of a chain of research stations in the Colonies, and it has been suggested, although no definite decision has yet been come to, that the administration of those research institutes should be entrusted, amongst other duties, to a Council in England consisting of a Chairman and two other whole-time officers, and to a number of technical and other members who, judging from the scheme as it has been adumbrated, would not be mainly officials and would all be part-time officers. The Director of my own Bureau—that is to say, myself—has been specifically mentioned as one, and also the Director of the Bureau of Entomology (Dr. Marshall). Neither of us is a Civil Servant. The Director of the Royal Botanic Gardens, Kew (Dr. Hill), is mentioned as another, *ex officio;* also a representative of the Imperial Institute, a chemist, and so on. A body of that sort, I take it, would almost certainly be in large part a non-official body, something on the lines of the body which is at present controlling my own Bureau. My Bureau is controlled by a Managing Committee with Lord Buxton, who holds no official position now, as Chairman. There are about 20 members. That may seem an unnecessarily large number, but there are a good many interests which have to be considered. Those 20 members represent the leading Universities and Research Institutes of the country with a sprinkling of officials. I can say from my personal experience that that is a very satisfactory method of managing the affairs of an institution like the one to which I am attached at present.

53,324. Are there any laymen among the 20 members, other than Lord Buxton?—There is an official of the Colonial Office and an official of the Foreign Office, who are both laymen.

53,325. How often does that body meet?—Twice a year normally, and special meetings are held when any matter of importance arises. There has been one such meeting this year, so we will have had three meetings altogether this year.

53,326. With whom do appointments lie?—With the Managing Committee as a whole; but the Director actually suggests the appointment and submits it for approval.

53,327. What about the finance?—It is rather difficult to explain that. The actual handling of the finance is in the hands of the Crown Agents, because they collect contributions from 40 different Governments in the Empire. I prepare a budget, under different heads, and that is placed before the Committee, who scrutinise and pass it; but the actual raising of the money is left to the Colonial Office. The Secretary of the Committee is a Colonial Office official, and he corresponds with the Colonies in regard to their contributions. The Foreign Office representative corresponds with the Sudan in regard to their contribution.

53,328. That is an illustration of the principle?—Yes. This new Council, which originated with Lord Lovat's Committee, has been accepted in principle, I think, and expanded in the Colonial Office at the recent Governors' Conference, and mention has also been made of it in the public press. From that, I gather that it is likely that the destiny and the administration of this chain of research stations will be placed in the hands of that Council. The question will certainly arise whether it will be possible to work without a Local Committee as well. That is a matter to which I have given a good deal of thought. It seems to me that in the case of India it would probably not be possible to work without a portion of the Committee being in India, say three. I had in mind something like one Director of Agriculture, one distinguished Science Professor in a University in India, and one business man, a layman, if you could get him. I had in mind some Committee of that type in India in close touch with the Committee at home.

53,329. Let us be quite clear. Is your suggestion that Pusa, as principal research station under the Government of India, should be transferred to the body managing the chain of research stations?—I do not know that that would be practicable, but I do not see why that body should not be made use of in some way, and possibly the management entrusted to the three gentlemen I have proposed in India, but with the assistance of the supervising advice of the Committee at home.

53,330. So that you think there might be a link in this chain of Imperial research institutions in India quite apart from Pusa, and that certain persons who are members of the Imperial organisation might take a hand in managing Pusa. Is that the idea?—Something of that sort. The difficulty in the Colonial Office has presumably been that they are not in a position to speak for India. They have simply said they will require, in this chain, an eastern research station. That might be in Ceylon or in Malaya or in India. Supposing that India were selected, they would naturally consider whether Pusa did not fulfil the bill. I think that India is unlikely to be selected; Ceylon is possibly more likely.

53,331. You are aware of the changes in the situation in India which followed the Reforms?—Yes.

53,332. The problem now appears to be to evolve, for the central station, a system of management which will place the central station in a position, *vis-a-vis* the Provinces, in which it can be of the greatest service, and from which its recommendations will be palatable. That is the problem as between the centre and the Provinces. Your suggestion would give the Provinces no share in the management of Pusa, would it?—One Director of Agriculture would be on the Committee I mentioned.

53,333. One provincial Director of Agriculture?—Yes.

53,334. Would not there be somewhat of a tussle as to which Director of Agriculture was to be appointed?—Certainly there would, but I am against a large Committee. I did think of a large Committee, on which you could have three or four of the Provinces represented in rotation, but I do not think you really want a large Committee. The Institute of Science and Industry in Australia is controlled by an Executive Council of three, the Chairman of which, and one other member I think, are part-time members. My feeling is that so long as Pusa remains a purely official institution it is liable to have alternation of "petting" and of the opposite. Reductions of staff come about just at the wrong moment. It is terrible to think that in seven years the scientific sections in Pusa have been practically sterilised by the reduction in staff. In my own section—the section which I built up over many years—I used to have three research officers at work. There is now only one, and the work is more than one man can do. In the same way, in the Economic Botany Section there is only one officer now. There used to

be always two and at one time three. Reductions of that sort have got, I think, to be combated in some way, and I do not consider that a Government institution is in a position to fight reductions in a country like India. Even in England I do not think it has as strong a position as a non-official institution. I am bound to say that in my experience in India there is no real educated public opinion, either amongst the English officials or amongst Indians, in regard to the meaning of scientific work. I may give you an illustration of that. I had a member of the Governor-General's Executive Council (the Member for Revenue and Agriculture, as he was called in those days) come down and inspect my section. He spent two hours going through the work, with great care as it seemed to me, and then spoke of my work as dealing with insects. My work has nothing to do with insects. When a thing like that happens you can understand the attitude of the scientific officers at Pusa.

53,335. Meantime the position appears to be this: that unless Pusa can claim attention by the prestige of the research workers engaged there and by the excellence of their work, and unless at the same time you can, as you suggest, get away from the notion that Pusa is a Central Government institution rather than an all-India institution, from the provincial angle the criticism that Pusa is entirely a Central Government institution will remain. Does it not occur to you that it may be necessary to give more than one Province a share in the management of Pusa, at least in the direction of research?—Yes. I would have no grave objection to a proposal of that sort. I dislike large committees as a rule on principle, but in the peculiar circumstances of India I would have no objection to a proposal of that sort. You could have, say, a Committee of five or even of seven. In that case you could get, say, three of the eight major Provinces represented (counting Assam and the North-West Province as minor Provinces), and if you gave them representation in rotation you could possibly do with three provincial representatives.

53,336. How often do you think a body responsible for administration at a centre such as Pusa would require to meet?—Not more than twice a year. In my scheme there would have to be a whole-time and highly-competent Director of the Institution, who should be free to do what the Director in the past has not been able to do, namely, to tour as the Director of the Institution. I was able to tour as Mycologist, but I was not in a position, ordinarily, to tour as Director of the Institution. If there were a whole-time Director, it should be part of his duties to tour freely in India and to see the problems which really required taking up, and to watch new developments. For instance, there is this new big development of the consumption of Indian tobacco in England. A very large export trade in Indian (unmanufactured) tobacco has grown up since the War. There was none in 1914. Shortly before the War, India used to export tobacco to Italy and France, but none to England. Now it exports a very great deal indeed to England. Those are matters which require attention. Everybody here knows that the Indian tobacco is not the equal of other Empire-grown tobacco—the Rhodesian and Nyasaland tobacco, for instance. Is there any reason why it should not be? Has that matter been taken up? Those are matters which I think the Director of an institution like Pusa should be in a position to seize upon when they arise and to see that they are not neglected; but he could only gain information of such things by touring. Of course, it is quite possible that these matters have not been neglected; I cannot say. They are simply illustrations of the type of work on which an institution like Pusa should keep its eye very closely—new developments.

53,337. To go back to the question of the Board of Management, do you suggest that the heads of sections should be members of such a Board, or

that some of them should be?—No, certainly not. I would have the Director and Council controlling the scientific work of the institution. I am quite certain that is the only way to run a scientific institution. The Managing Board should not interfere in the details of scientific work. They should receive reports; they should be men who are in a position to judge whether the institution is doing its work properly, and if not to make the necessary changes, but they should not direct the scientific work. At Rothamsted or any other institution of the sort, the Board of Trustees does not, I think, lay down the lines of research.

53,338. Would you suggest something in the nature of a Board of Studies, apart from the Board of Management?—Nothing beyond the Pusa Council.

53,339. Have you thought of the possibility of a Research Council with agricultural research throughout India?—Specifically agricultural, or research in technology as well?

53,340. I should say in technology as well?—A body of that sort might do very well ultimately, something on the lines of the National Research Council in America; but, of course, they do not do more than work out projects. They examine proposals for work on large problems, and they organise the matter on a proper basis. They apportion different parts of the work to different institutions throughout the country, but they do not interfere with the actual carrying out of the work in any way. They administer the money; that is really what it comes to.

53,341. *Professor Gangulee*: They suggest the problem and apportion the work?—They suggest the problem sometimes, but the large industries very often suggest the problems to them.

53,342. *The Chairman*: You have not contemplated that the Board of Management at Pusa should concern itself with the co-ordination of research throughout India, but merely with the management of Pusa?—Yes, it should concern itself only with the management of Pusa. I do not think there is room for a general co-ordinating body for India; the problems of research are so extraordinarily different in the different Provinces. Ultimately, I think something like these National Councils handling research in the primary industries of the whole country is likely to come, but I hardly think the time is ripe for that in India yet.

53,343. Did you do any post-graduate teaching at Pusa?—Yes. I had, at one time, five post-graduate students. I had an average of three for a considerable period of my time.

53,344. Indians?—Indians. Five was the maximum that I should take at any one time.

53,345. What do you say of their training and qualifications at the time they came to you?—They varied very much indeed. The experience I had, on the whole, was that it was better to get, if you could, a man of the practical type and not so much of the literary class. The University graduate who had the M.A. degree of Bengal or Madras and who came from the townsfolk was not always a very good man; but I have not had enough experience to be able to generalise on that. I did put up a note to the Calcutta University Commission that it would be a great help to us if we could get graduates from Calcutta University from the rural community. There were very few available.

53,346. Had you enough students before you, during your service in India, to form any view as to the efficiency, or the reverse, of the teaching at the Universities in the subjects with which you are familiar?—Yes. In certain cases I examined myself in the Calcutta University, and I sent in a note after one examination for a higher Degree, saying that I considered that the degree should not be given by the University, because it was not

in a fit position at the time to teach the subject. It was a high degree in botany (I think the D.Sc. in botany). They had no whole-time Professor of Botany in the University at the time.

53,347. What was the result of your communication?—They strengthened the botany teaching.

53,348. Were they giving degrees at the time of your communication?—Yes, I was one of the examiners, and I gave a degree to a man who had had his training at Madras. I think there was no Calcutta candidate at the time.

53,349. *Professor Gangulee*: They have now two whole-time Professors?—Yes. They have made quite an improvement since then.

53,350. *The Chairman*: On the question of what particular service a central institution in India could render, and which the Provinces could not do for themselves, do you regard the Pusa of the future as being engaged mainly in research problems of a fundamental nature and of general application throughout India?—Yes. On that point I have some doubts as to whether cattle-breeding work, for instance, is suitably carried on at Pusa. I am not in a position to speak about it emphatically, but I have always had some little doubts about it.

53,351. The proper division of functions between Pusa and the Provincial Institutes would require very close touch between those directing research in the Provinces and those responsible for its direction at Pusa, would it not?—The same sort of touch that exists in England between institutions such as Rothamsted and the Ministry of Agriculture.

53,352. But in England it is very easy to attain, because you never have to spend more than one night in the train, whereas in India it is very different. Distances have a very real bearing on this problem?—If the staff in Pusa are encouraged to tour, and if the Director tours and sees the problems and selects those of general bearing to be tackled at Pusa, I do not think more is necessary. I always considered also that the meetings of the Board of Agriculture in India were invaluable. They kept everybody in touch personally with the work of other departments.

53,353. To go back for a moment to the question of finance, have you thought out, in detail, how this new system of management at Pusa is to be financed?—I have not thought it out in detail. I think the money would have to be handed over more or less unconditionally to this proposed Council to administer.

53,354. An annual grant?—Yes. The endowment grant in Australia to the Council of Science and Industry is £350,000, and Mr. Bruce has told them that they are not to go to him and say that they have not enough money. His attitude is that they are not to be starved for want of money.

53,355. Are the accounts subject to audit in Australia?—I should imagine so; I do not know. I may mention that Mr. Julius, the Chairman of that body, will be in England next week.

53,356. Are you familiar with the workings of the Development Commission and Development Fund in this country?—Not in detail.

53,357. I judge from that that your Bureau does not enjoy any financial support from that Fund?—No. The whole of our grants are paid over unconditionally to us by the Overseas Governments. Forty different Governments pay us subventions. They go as low as £11 in the case of Tasmania and up to several hundreds of pounds in the case of India and some of the larger Dominions. Australia gives us £600. That money is handed over to the Crown Agents, who take instructions from the Managing Committee of the Bureau as to how they are to expend it, and I submit accounts every year which are audited by the Crown Agents.

53,358. Have you anything to say about the terms of service at Pusa? Do you think the existing conditions are such as to attract the best type of worker?—That opens up a very big question. I think there is not very much that I could say on it beyond what I have said on previous occasions.

53,359. *Sir James Mackenna*: The scheme which you have outlined for the position of Pusa in this Empire project of research stations seems to contemplate, rather, the position of the Central Research Station of the Government of India with reference to the activities of the Colonial Office in the matter of agricultural expansion; but we are much more concerned with the relation of Pusa, as the apex of agricultural research in India, to the Provinces. In the course of our tour we have had constant criticisms made to us of Pusa from the Provinces to the effect that they were not getting much good from Pusa. Our aim is to try to evolve some scheme to link up the Provinces more closely to our central institution. The introduction of Pusa into this Colonial scheme rather suggests a further detachment from the linking up of provincial activities in India. I should like you to give us your views as to how we can bring Pusa into closer touch with the Provinces. Would I be correct in thinking that, in your view, there would be no great objection if Pusa were completely put outside the provincial sphere altogether and taken as a Central Research Institute?—There would be no very grave objection to that. My feeling as a scientific man is that, in order to get the best results from scientific research you do not want to have continually before you the needs of the country. The Director may; but the business of the actual man carrying out the work is to solve the problem which is put before him in any way he can. The less he is hampered by being continually worried by statements that his work is of no use to the country, the better. I imagine that such statements have been made even in the case of Rothamsted; I do not know. Yet we all admire Rothamsted. The workers there have gone on quietly working away at their problems, and they have done a great work, long range work. They have not been hampered by having had continually before them the needs of a particular small community in the country. They are attacking fundamental problems all the time. I imagine it is quite possible that some of the Rothamsted results are more valuable to other countries than they are to England. I do not think the actual worker can afford to have in mind the particular requirements of the community for which he is working. It is extraordinarily difficult to get scientific work so planned out that you can do so. Select your problems by all means. It is like the old saying, "Do not marry money, but go where money is." Do not take a problem because it happens to be of economic importance, but have your interests in groups of problems which are likely to be of economic importance.

53,360. You would make Pusa an isolated centre of agricultural research, and allow the Provinces to work out their own scientific investigations on their own account?—In practice you could not make Pusa an isolated centre of research. There would be circumstances tending continually to break down the isolation; and I would encourage those circumstances. I would encourage the Director and staff to tour about the country.

53,361. That question of the Director travelling about the country means that he will have to be a whole-time Director. At present the posts are combined?—Yes.

53,362. You think that it would be enough to make Pusa a sort of Rothamsted, a centre of concentrated research, to have a whole-time Director who was a man of scientific position and eminence, with free right to travel up and down the country, bringing back, I presume, problems or suggestions for problems to be worked out at Pusa?—Yes, and I would encourage meetings and conferences at Pusa.

53,363. Do you think that that would relieve the present amount of criticism which is directed against Pusa as being out of touch with the Provinces? If it were said that it was deliberately out of touch with the Provinces there would be nothing more to be said?—That is right.

53,364. Do you think that would be acceptable in India?—I do not know what the position is now. It would not have been acceptable ten years ago; I am quite sure of that. The departments in those days would not have said that Pusa was doing nothing for them. That matter came up, you may remember yourself, more than once at the Board of Agriculture, and we found then that the view held was that, on the whole, Pusa was fulfilling quite a useful function in aid of provincial Departments in tackling fundamental research problems. That attitude may have changed on account of causes which I have attempted to suggest in my note of evidence, namely, the curtailing of the staff, with its natural consequence on the result of research work; decentralisation (which must have had a certain effect in India), and the disheartening effect of doubt, which I know exists in the minds of the staff, as to the future of Pusa.

53,365. Assuming that we accept the view that Pusa is to be taken out of the general administration of the whole Indian Empire and is to be a separate Research Institute for fundamental research, have you any views on the position which Pusa should take up with reference to education?—Post-graduate work entirely, and post-graduate work limited to small numbers. Five was the maximum in a section in my time, and I think five would be the maximum in most of the sections. It would give you about fifteen or twenty if you filled them all up, which would be ample to meet any demands, I think, at present and for a long time to come in India.

53,366. What do you think of the elaboration of a composite course for post-graduates? Would you have a general course covering a variety of subjects, or would you just take post-graduates for research only in a particular subject?—I would take them only for research in a particular subject.

53,367. That being so, you would have Pusa administered under the Government of India by a body of Trustees?—Yes.

53,368. Three or five, do you think?—I should like to see a small body like that.

53,369. Should the Government of India, as the provider of the funds, have a member on the Board of that body?—I think they should, but then I think they might regard the Director of Agriculture as the man who could look after their interests.

53,370. You mean the Director of Agriculture from the Province?—Yes. I do not know whether the Government of India would trust the administration of their funds to such a man—whether they would be prepared to regard an official from a Province as their representative.

53,371. What about the Secretary of the Department of the Government of India as Chairman of the Board of Trustees? Would that officialise it too much?—I do not know. If you had a Board of five or more, I would say without any hesitation that a high official would make an admirable Chairman then. That is what I suggested when I was working out the proposals with regard to the Rubber Research Institution in Malaya. I proposed in that case that there should be a governing body of officials and non-officials, the non-officials being in the majority but the Chairman being a high Government official, and something on those lines has, I believe, been carried out.

53,372. Applying the Advisory Council principle of the Colonial Office to India, and remembering that India is a very vast continent, do you think it would be possible to apply that Colonial Office principle to the various pro-

vincial departments in India and to have a Central Advisory body more or less directing the operations of the Provinces?—I do not like the word "directing."

Sir James MacKenna: Well—advising.

Professor Gangulee: Stimulating research?

53,373. *Sir James MacKenna*: Yes, stimulating; performing the same functions as the Advisory Council?—The Agricultural Council of the Colonial Office will presumably have considerable executive functions. They will no doubt have the administration of the finance, the making of appointments, and matters of that sort in their hands.

53,374. Irrespective of the wishes of the particular Governments?—Yes, but not irrespective of the wishes of the Director of the Institution. Take the case of the Amani Research Institute in East Africa. The Director has been appointed, and he is making appointments, not on the advice of the East African Colonies who are subscribing towards the scheme, but after consulting advisers in England.

53,375. What are your views of the efficiency of the Pusa Council, of which you and I were members for many years?—It varied a lot. It was useful sometimes, and sometimes it went on for a year or two when it had nothing of importance before it. It was a useful weapon in reserve. The regular meetings are also an advantage. The staff met together and discussed their work officially. They were supposed to put before the Council, and a good many of them did, proposals for new work and the lines on which they meant to carry it out. I think that is very sound.

53,376. What about the relation of Pusa to the Universities?—As I have said, my governing body would have at least one distinguished Professor from the Universities on it; but with regard to making Pusa a constituent part of a University, that matter has been discussed time and again, and most of the staff at Pusa have been definitely against it. I have always been against it myself.

53,377. Take your own subject of mycology, what is your view of the adequacy of the staff and of the prosecution of mycological work in India?—It is too low at present.

53,378. Have you any rough idea as to the extent to which it should be expanded? For instance, at Pusa what do you think is an adequate staff? In your time there were three of you?—One was a supernumerary officer who was intended to act in leave vacancies and matters of that sort. I think the organisation now is to make each Province self-contained in that matter, is it not? If that were so, then possibly two, but a minimum of two.

53,379. And one in each of the major Provinces at least?—Yes. The drier Provinces of the North-West and of the Punjab have no need for a full-time Mycologist. All the rest have, I think, and some of them have room for two.

53,380. Are there any outstanding problems which require special arrangements at present in India?—No, I do not think there are at present, not in my particular subject.

53,381. What grant does the Government of India give to the Bureau?—£600.

53,382. That should be continued?—I hope so.

53,383. *Mr. Noyce*: Who represents India on your Council?—Sir David Prain.

53,384. *Professor Gangulee*: Why do you suggest that Pusa should be developed as an isolated central research station?—In order to withdraw it from the constant ups-and-downs through which it has been going.

Dr. E. J. Butler.

53,385. Isolation is not desirable, is it, for a central research station?—Yes, I think so. I think the more isolated a research station is in regard to official influence and political influence, the better it is for its work.

53,386. We are not concerned with the political aspect?—Well, take the official aspect.

53,387. We want to view the whole question from the efficiency point of view. From the point of view of the efficiency of scientific research, do you think a central research organisation should be isolated from the various other links in the chain?—As I know the circumstances in India, I would sooner see Pusa outside of the Government ambit altogether. I believe it would be able to do its work more quietly and more efficiently in that case. Let it have as close contact with those below as possible (if you like to count the research institutions in the Provinces as being below Pusa, which I am not prepared to admit); but let it be free from influences from above. In other words, do not let it be influenced by official or political views at all, official views especially. Let it be free from the risk of a sudden economy campaign cutting its grant and reducing its staff.

53,388. Your chief object is to guarantee the continuity of research work?—Yes.

53,389. And a settled research policy?—Yes.

53,390. Could not you achieve that end by establishing some form of co-ordinating agency between the research station and the Provinces?—I do not think we could. We have not done it in the past.

53,391. What is the link, for instance, between Rothamsted and the Rowett Institute in Aberdeen? They are under two different administrative heads, as far as agricultural research and education is concerned. Nevertheless, there is a co-ordinating link between the two institutions?—A voluntary one, surely; the only contact they have that matter is voluntary contact.

53,392. How are you to encourage voluntary contact in a country like India?—I do not believe there would be any difficulty. I never found that there was any serious difficulty. I cannot think why these difficulties have grown in the last few years, unless you are getting like Australia, where work has often been hampered in the past by inter-State jealousies. They are doing the best they can now to break them down.

53,393. Through the establishment of a Council?—And through the promotion of meetings and touring. That is the way to get over it.

53,394. Do not you think the tendency would be to isolate Pusa entirely from Provinces if you did not have a co-ordinating agency?—That tendency has come, I understand. There has been a tendency in the last few years to isolate Pusa. The result has been, as I gather, that Pusa men do not tour as freely as before. Perhaps they are not so welcome as they used to be. I should break that sort of thing down by having the Institute non-official, so that there could be no feeling, as there has sometimes been in the past in the Provinces, that the Pusa man was butting in. If he had nothing to do with officialdom he should be an honoured guest.

53,395. Assuming that Pusa were developed as an isolated centre of research, do not you think there would be the difficulty of bringing the Provinces not only into the Research Council which you suggest, but also into the bigger problem of considering the fundamental research for India as a whole?—I would like to see some machinery for that. I am not certain that the old Board of Agriculture was not really a very admirable machine for that purpose. Their biennial meetings brought up problems which the different Provinces thought of importance, and very often they were very helpful to us.

53,396. Would you not have this sort of link? Supposing in Bengal there appears a specific fungus in the paddy fields. A central organisation (your Department of Mycology there) would send one of its workers (a central officer) to the Provinces to investigate the incidence of that plant pest. Let us take the reverse case. A provincial man, in order to get some experience of the technique of investigation, might come in to the central organisation to work. If you maintain the isolated character of the research station, such an exchange of workers is not possible, is it?—It is perfectly possible, in regard to the first side of the question, at least. In the past, when a major problem arose, we always sent men from Pusa. Not only have I sent men from Pusa, but I have employed local men and have paid them out of my own budget in cases like that. I had members of my staff working on local problems in close touch with the local department for months on end. I do not see why having Pusa as an isolated research institution would in any shape or form prevent that continuing. There might be some little difficulty in the reverse direction, namely, in getting men from the Provinces to come up to Pusa, but I do not think that need be the case.

53,397. What about overlapping of research problems? Supposing you are carrying out an investigation on some plant diseases in Pusa, may not the Department of Agriculture in Bombay be carrying on the same work at the same time?—There has been no overlapping in science, which I have ever come across, that was not beneficial. You get two different minds tackling the same problem, and that is an advantage. There is too much made of this bogie of overlapping. It is only a bogie. It is disregarded in many institutions in this country.

53,398. You advocate that in Pusa we should have adequate arrangements for post-graduate training?—Yes.

53,399. Would you affiliate Pusa to any University?—No.

53,400. So the students going to Pusa for post-graduate work will not get any degree for their work?—We suggest they should get a diploma like that of the Imperial College of Science.

53,401. Would that attract students?—It used to in the Imperial College.

53,402. Degrees have some fascination, have they not?—A.R.C.S. ("Associate of the Royal College of Science") was a very honoured group of letters for many years.

53,403. Would you not recommend a similar arrangement as that made at Rothamsted, whereby the workers there carrying on post-graduate work may get a degree by presentation of a thesis to a University?—Yes. That is a very sound suggestion, but you would want an alteration in the Universities to get that. I do not think there are any University degrees at present given which would quite take a thesis like that.

53,404. Not quite, but we might suggest that some Universities which have already developed science teaching might consider it?—I entirely agree with you. It would be a very great advantage to get your post-graduate man working definitely for a thesis.

53,405. Can you visualise such a thing as the affiliation of Pusa to an Imperial University like Delhi?—So long as it does not become a constituent college of the University. You are hampered then by the University regulations, but in regard to outside students going up to take degrees on a thesis basis on work done at Pusa, certainly I agree; the men would benefit.

53,406. I understand from the literature which I have seen, dealing with your Bureau, that it is really a central clearing house of information relating to mycology and entomology throughout the Empire. Is that right?

—Yes. We also have another side. We have two equally important sides. At any rate, I have always regarded them as of equal importance. We have an information side. That covers the monthly journal and all the informational and clearing house work. Then we have the actual dealing with specimens of plant diseases which are sent in to us, in order that, where possible, we may grow and study the organism. We have a separate staff for that. I have two members of the staff who have nothing to do with the clearing house or publicity work whatever; they are engaged entirely on systematic research into the identity of these organisms which are causing disease, and with comparative studies of strains of them from all parts of the Empire—that type of work.

53,407. Through what channel do you come in contact with the forty Governments which contribute to your funds?—We publish a monthly journal supplied free to them. We have powers of corresponding direct with the scientific officers in all those Governments, on matters other than administrative matters. We offer the hospitality of our laboratories to their men when they are home on leave, which is pretty frequently; in the case of the African Colonies it is every twenty or thirty months. Therefore, we do keep in close personal touch with our colleagues. Also, we tour a good deal. I have visited most of these Governments which are contributing, and I know nearly all the mycologists personally. We aim at keeping up personal contact. We have £200 a year specifically earmarked for overseas travel, which cannot be used for anything else and which accumulates from year to year if not expended.

53,408. These forty Governments are interested in your Bureau because they can get abstracts of all mycological work?—I would not like to say that that is the chief reason. My own view is that in the long run the other side of our work will be more important. Our "pot boiler" is our publication and our abstracting. That is the thing which they all say they cannot do without; but actually I think the critical side of our work, the consulting side, in the long run will be the more important side.

53,409. Your Bureau acts as a central organisation, co-ordinating the various work?—It is consultative and co-ordinating.

53,410. Do you think the principle on which your Bureau is developed can be adapted in India?—Not quite.

53,411. Could not it be undertaken in connection with, say, agricultural research in India as a whole by a central organisation designed for the purpose of co-ordinating research?—They already have their own publications. The Agricultural Journal will take notes and reprints, and that sort of thing. They do a good deal of that already at Pusa.

53,412. The Agricultural Journal of India is more or less a popular journal ,is it not?—Yes, but it contains reprints of technical articles.

53,413. It does not fulfil the same function as your abstracts?—There is no need for it to do so.

53,414. *Sir Henry Lawrence*: In your note of evidence you refer to the continuance of Pusa as being linked up with a continuance of an English staff in some way. Will you develop that a little?—I say "The higher research staff is largely English and must remain so for a considerable period if the Institute is to do its work properly." That is my opinion.

53,415. Will you explain further the phrase "and must remain so"?—I do not consider that up to the present, in the cases of which I have knowledge, we are likely to get a research staff in any other way which is capable of doing the work.

53,416. Can you suggest for what period that state of affairs is likely to last?—I cannot.

53,417. How would you obtain the further recruitment of English officers? You consider it necessary for the continuation of the high standard of work at Pusa that there should be such English officers. How do you suggest that

they should be recruited?—That would be one of the duties of the Council, and one of their more important duties.

53,418. They should have a free hand in appointing the best men, regardless of racial considerations?—Regardless of anything.

53,419. You think that the guarantee of this Council would be a sufficient safeguard to attract young men from England, do you?—That is a difficult question. It is a question which does not appear to have yet been solved by the Commonwealth Council of Science and Industry. They have advertised high appointments in mycology, entomology and other subjects at a salary beginning at £1,200 a year, but they have not been able to offer them, as yet, on more than a three years' basis. They propose to make them permanent and pensionable, I believe, but there are practical difficulties which they have not yet solved.

53,420. They have been able to get good men on the three-year period, have they?—Not only that, but, though Australia is a country which is very jealous of its own rights, they appear to be sufficiently independent to be able to make an appointment even of an Englishman or a Canadian or a man from the United States without having Australia up in arms against them.

53,421. Do you think there would be the same freedom from political pressure in India?—I think there should be. It would be part of the duty of the Council at Home. That is one of the objects, as it seems to me, of a Council at home.

53,422. You suggest that the Council in England should make the appointment to the Institute in India?—They would at any rate approve of it.

53,423. *Sir Ganga Ram*: Which Council do you mean?—I propose in my scheme that there should be a Council in England (one might, if necessary, make use of the Agricultural Council which is proposed for the Colonial service and which seems to me to be exactly the right kind of Council) which would have two or three permanent members who would have the advice of a group of scientific men, mostly non-officials.

53,424. *Sir Henry Lawrence*: In your judgment, would that Council be in a position to adjudicate on the comparative merits of men trained in India and men trained in England?—They would take advice from the people in India. Such men do come home. They nearly all have a period of education here. They would mostly be known to the Council personally.

53,425. At about what age do you consider that a young man is competent to conduct research work? Do you envisage any period of training between his University course and his appointment to research work?—You do not often get them starting research work younger than 25 in practice.

53,426. We were told by Sir Francis Floud that they found men useful from the age of about 32 onwards. They had to be put through a very strenuous period of selection and observation, men taken on for technical work, recruited from private employment in England. That is not possible in India, is it? You must take men direct from the University, must you not?—Do you mean for this post-graduate training at Pusa?

53,427. I am now thinking of people appointed from England?—We do not ever take research mycologists direct from a University. Our whole policy, both in India and in the Colonies, has been to take a man after he has had a period of post-graduate research training for at least two years. Actually, the bulk of the early appointments at Pusa were made from men of over 30 years of age. We worked the details out for one Royal Commission, and we found that nearly all the men at Pusa were 30 years of age, or over, when they joined.

53,428. Do you consider that the best age at which to recruit?—I would not go so far as to say that, but perhaps it is easier to judge of a man between the ages of 27 and 32.

53,429. At that age do they settle down to conditions of life in India?—Yes.

53,430. You mention that of the men whom you did train for post-graduate work, a certain percentage had certain defects owing to their previous urban life?—Yes.

53,431. What was the principal defect that you observed?—A want of a practical grip of the subject. Their work was too much divorced from practice. It is very difficult to explain it.

53,432. Cannot that be overcome by experience?—No. It is engrained in them.

53,433. So that you consider a man must have had a rural upbringing?—I would not go so far as to say "must have had," but it is preferable that he should have had. We made the same stipulation when, on one occasion, we addressed the Secretary of State as to what he should look out for in regard to appointments to the Indian Agricultural Service made in England. We found certain sides of the work, at any rate, in which it was an advantage to have a man with a rural upbringing.

53,434. That is a question of environment and not a racial question?—It is a good deal hereditary, I think; it is due both to hereditary influence and environment.

53,435. *Sir Ganga Ram*: Do you propose that the majority of this managing committee should be non-official?—Yes.

53,436. From your experience of India, do you think you could get men sufficiently capable to do it?—A very small committee in India.

53,437. What number do you suggest?—Three to five, something like that.

53,438. Do you think we are advancing to better days in India and securing better treatment for the people?—That is a difficult question.

53,439. Would the sections in the Provinces be under this managing board?—No.

53,440. It would be independent of it?—Quite independent of it. This is purely for Pusa as a research unit.

53,441. *Sir Thomas Middleton*: Reference has been made to the quality of Indian students, and I think the term "ingrained qualities" was used. I should like to get your view as to whether the defects which you may have noticed in men who came under you for training could be ascribed mainly to such ingrained qualities, or to defects in their earlier training, their University training? Is it the system of training, or the men, who are at fault?—I think it is a little of both.

53,442. Is it not fairly obvious that the system of training was poor in the past?—Yes, it certainly was, though not everywhere; there were some bright exceptions where good training was given. But it was a little of both in the cases I met. I have all along felt that in India we were not really getting the right material; we could have done better if we had got more of the rural classes; I have always had that feeling.

53,443. *Professor Gangulee*: Do you think the research workers in this country are recruited from the rural classes?—I do not know. I know that in India, when we ask for Englishmen or Scotsmen to come out, we like them to be rural if possible. That is for certain sides of the work, not for all.

53,444. *Sir Thomas Middleton*: You made reference to the output of work from Pusa, and you say you have noticed a slight falling off, you think, both in quantity and quality?—I do not want to emphasise that.

53,445. There was a very great reduction in the staff of workers about four or five years ago?—Yes.

53,446. And therefore you must expect some reduction in the volume of output. What struck me about Pusa was that I could not describe Pusa as a single research station, but as a group of linked research stations.

Quite a number of subjects were being taken up in Pusa which, in this country, would have been allocated to different institutions?—I think, perhaps, too many are being taken up.

53,447. That is the point upon which I want to get your advice?—Yes, I think that is possibly a very just criticism; I have had that feeling myself for some time. I am afraid I was, in part, responsible for some of those subjects; at least, I supported the proposals for some of those new sections. I have since thought that perhaps it was broadening the field a little too much.

53,448. That led me to feel that it was an unwieldy institution to be managed by a scientific Director?—I am not sure that that is not going to correct itself of itself. There is a movement towards the cattle work being done elsewhere. The cattle work at Pusa is becoming of minor importance, I have been told.

53,449. The surprising thing is that Pusa farm, apart from the experimental area, is being run entirely for cattle?—Too much so.

53,450. All the scientific work being done on cattle was transported to Bangalore, hundreds of miles away?—In the scientific sections, we kicked against that utilisation of the farm for the cattle time and again; we never could get enough experimental ground for the sections; we had a constant fight with the Agricultural Section to get enough land.

53,451. There you were with cattle in large numbers at Pusa, and the nutrition work on cattle being done hundreds of miles away without proper facilities for keeping cattle?—I am not in a position to say whether Pusa is or is not a good place to do that class of cattle work, but I agree with you, it does make the place unwieldy; it is too big.

53,452. As you know, in this country we have a system whereby, if an institution has a specific problem, there is a Director in charge of the institution?—Yes.

53,453. But we also have another type of administration: we have in one institution a Committee of Staff, of whom one is the Chairman, and there is no actual Director?—In the old days I would have preferred the latter system, but I think possibly now a Director would be, for a time at least, useful in order to get Pusa back again to its position of being in touch with the other workers in India; it is losing contact. I am quite certain that, if my proposal were carried out and it became a non-official institution, that would not increase the loss of contact, but would do the opposite; if you put in the right kind of man, you would get your contacts back again.

53,454. The position being that Pusa is a group of research institutes, is not it a fact that the staff of each of them is too small?—The staff of each of them is too small.

53,455. Much too small?—There are five main scientific sections which require to be adequately staffed. In my own section they require to have at least two; two was the absolute minimum with which we could carry on our work.

53,456. To go back to the question of scientific Directors, is there no means by which the routine work which is at present thrown upon them could be given to someone else, so that the Directors' duties should be scientific and not administrative?—Yes, it would be of great advantage if something of that sort could be done. The last year that I was there the routine work of the Joint Director occupied four hours a day.

53,457. I think that is pretty much the position at the present time. Most of the Director's time is taken up on routine work?—Yes.

53,458. And as, presumably, the Director is one of the senior and most experienced officers in India, and we cannot get many such research workers, it seems to be a great waste of time that he should employ himself on routine duty. Can you make any suggestion for improving that position?—Of course, under my proposal, his communications with the

Government of India, or, at least, with the Agricultural Adviser, would cease. A great deal of the work is taken up with the Agricultural Adviser's correspondence. The Agricultural Adviser has to advise Government, and in order to do that, he has continually to draw on Pusa for information. Then there is the internal administration, which, of course, is a big thing too; I do not know that you could reduce that very much. You might have a secretary-accountant.

53,459. *Sir Thomas Middleton*: A secretary-accountant with an estate agent's training to look after the business?—Yes, that type of man.

53,460. What amount of time does the editorial work involve?—It is an appreciable amount. It is difficult to say how much time it takes up: probably one full day a week, or perhaps hardly so much.

53,461. The actual editorial work, judging from the results of the last few years, seems to me to be very well done; I do not know what your view is?—There is a very good trained staff there; it is a staff that has grown up with the publications.

53,462. *Mr. Noyce*: Have you given any thought to the future of the Agricultural Adviser's appointment, if you have a whole-time Director of Pusa, as you would under your scheme?—Not very much The side of the Agricultural Adviser's work that I saw (I held the post myself for two or three weeks) was mainly in connection with Pusa; most of the cases that I have seen were those that definitely concerned Pusa. The other side of his work, the side in regard to the Provinces, I know very little about.

53,463. But if the appointment were continued and he had to advise the Government of India, he would still have to draw on Pusa, as you were saying just now?—I do not think he would, not much.

53,464. Where is he to get his information from?—He does not want to advise the Government of India on research matters; all the real agricultural work, the bringing of the work down to the people, would be done in the Provinces; it should be at the present time. Pusa is often not the best place for that.

53,465. When you say the greater part of the work of the Director on that side consisted in correspondence with the Agricultural Adviser, what sort of cases are you thinking of?—A great deal of it did; whether it was the greater part I cannot say.

53,466. Was it connected with the administration of Pusa?—Yes, a great deal with the administration of Pusa.

53,467. Scientific work?—No, not much with the scientific work; all these miscellaneous administrative matters that grow up; at the end of the day one often thought one had not done anything that mattered.

53,468. I am not quite clear why you think the financial difficulty would be removed if you de-officialised Pusa in the way you suggest; the funds would still be entirely provided by the Government of India?—Yes, but the say as to whether they were doing any good or not would not be at the discretion of one or two men; the Revenue Member and the Secretary.

53,469. It would be so if you came up for any extension of your grant?—Was there any fight made when these reductions of staff were made at Pusa? I have not been able to discover that there was. With the committee that I foresee there would be quite a row made both in India and here.

53,470. The reductions to which you refer were the result of universal retrenchment and nobody was in position to make much of a fight at that time; but would not the tendency under your scheme be to stereotype the grant for Pusa for all time?—I do not think so.

53,471. You would have to justify yourself if you came up for any extension, anyway?—These posts that were reduced when there was financial stringency have not been put back now that times are a bit happier; there

is nobody interested in it; there is nobody whose business it is to see that Pusa is adequately staffed at the present time.

53,472. I suppose the feeling is to a large extent that the work is work which should be done in the Provinces; have you any views on that, as to the quality of research work which is now being turned out at provincial colleges?—The type of work which they should be doing at Pusa cannot be done as well in the Provinces; they ought not to take on work at Pusa which can be equally well done in the Provinces; nor, I think, should the provincial men ordinarily do this long range research work if it interferes with other work; that should be left to Pusa.

53,473. Who is to decide what is long range and what is short range work? Who is to draw the line between the research work which is done in the Provinces and the research work which is done at Pusa?—There never was very much difficulty; the Board of Agriculture had, in some cases, to judge in that matter; all programmes came before the Board of Agriculture and were very freely criticised. I do not know how the Board of Agriculture is running nowadays, whether they have the same long meetings where we talked freely. But anyway, every programme was under scrutiny, and if we saw too much work being attempted in a Province we passed a resolution to that effect, and that had a certain amount of weight.

Mr. Noyce: I think the Board of Agriculture has stopped revising programmes, has it not, Sir James?

53,474. *Sir James Mackenna*: Yes, it has stopped.—I think that is a very great pity.

Sir James Mackenna: So do I.

53,475. *Mr. Noyce*: You think it is necessary to have somebody to scrutinise the programmes of work?—It often is necessary, yes. The Board of Scientific Advice could probably do it.

That is rather a decadent institution I think, if it still exists.

53,476. *Sir Henry Lawrence*: You point out that at Pusa too much land is given for this cattle breeding experiment, and, I gather, too much money and time spent over it. You do regard it as a necessary part of the Pusa work to carry out experiments in the improvement of stock, do not you? I think you said so in your note?—I did say so in my note At the time the scheme had not grown as large as it has now. There have been extensions on that side, I think at the expense of the extensions on the laboratory side; that is a pity. It has got unbalanced.

53,477. Are there fundamental problems with regard to the improvement of stock which ought to be carried out at Pusa?—I am scarcely competent to speak on that; I would not like to express an opinion.

53,478. *Mr. Noyce*: You refer to the geographical isolation of Pusa in your note; do you consider that to be a handicap?—Yes.

53,479. *Sir Thomas Middleton*: Seriously?—Yes.

53,480. *Professor Gangulee*: Could you suggest a better place?—Jubbulpore. I always thought Jubbulpore would be a very nice centre; you get the black cotton soil and the red soil; you could get a farm which is half on each; you are in the centre of the railway communications all over India. I may say the selection of Pusa was made by a small committee consisting of Sir Frank Sly, Mr. Mollison and Mr. Coventry. Unfortunately the terms of that committee were only to decide between Pusa and Dehra Dun. They found afterwards that if they had cared to select a third place it would probably have been considered, and Sir Frank Sly often told me afterwards that he regretted that he had not thought of a third place like Jubbulpore.

53,481. But for the purpose of field experiments the texture of the soil at Pusa is of a uniform character?—But there is no soil anywhere else in India like it; it is a peculiar soil.

53,482. For the testing of results, uniformity of soil is very important?—I believe you could get uniform soil elsewhere.

53,483. *Sir Thomas Middleton*: Is not a great deal of the soil of the Ganges Valley of the same type?—No, that North Bihar soil Pusa is on is quite peculiar; it is almost a marl; you will not find anything like it.

53,484. The Ganges is calcareous, is it not?—Yes, but not like Pusa. The Pusa soil is white soil; it cuts with a greasy section; it is an extraordinarily good water-holding soil.

53,485. You have, in the neighbourhood of Pusa, very fine cultivation?—Yes, some of the best in India, wonderful crops.

53,486. *Sir Henry Lawrence*: Would you, at this stage, transfer the site of the study of these important and fundamental problems to another place, such as Jubbulpore?—No, I do not think it could be done now; I have thought of it for years.

53,487. Do you mean administratively, financially or what?—Financially and administratively it would be very, very difficult to do it now.

53,488. Leaving finance aside?—What about all these buildings?

53,489. Leaving that aside; that is a matter of finance?—If you could leave all those things aside, I would change it to-morrow.

53,490. From a scientific point of view, you would advise that it should be moved?—Yes.

(*The witness withdrew.*)

Professor W. G. S. ADAMS, M.A., All Souls' College, Oxford.

Professor Adams was examined on the following subjects:—

1. The recent development of the community idea in rural life—reference to the Rural Community Councils, &c., in England—under the National Council of Social Service.

2. Co-operative organisations—with particular reference to the Horace Plunkett Foundation, London, as a clearing house of information.

3. Training in agricultural economics as an important element in school and college agricultural education and training for leadership.

Oral Evidence.

53,491. *The Chairman*: Professor Adams, we have had the headings of subjects under which you would be prepared to give us your views. Would you like to make any statement at this stage?—I stated to the Secretary that I had not been in India and that I therefore could only offer suggestions as to the subjects of which I had had some experience in this and other countries. I thought the best thing to do was to put down these very brief headings and trust to the Commission to ask me questions.

53,492. I am, personally, very interested in all these subjects; my difficulty is to bring your wide knowledge of these subjects as they exist in this country into terms of Indian conditions. Are you familiar with Indian rural life?—I have never been there, but of course, like most other men interested in agricultural matters, I have been interested in what was happening there. A certain number of Indian students come under one's care in the course of years, and one has had many friends out in India

with whom one has often discussed things and tried to find out the conditions there. I thought that it might be helpful if I developed somewhat heading No. 1 because possibly what I might say might suggest lines of information which I could secure for the Commission if desirable. I may say that the National Council of Social Service, of which I happen to be the Chairman, has its office here in London, and that I am sure the Secretary would be very pleased to provide any information he can, giving particulars which the Commission might find it desirable to follow up as regards the development of the rural work of the National Council in recent years. What strikes me very much is this, that in recent years there have been the beginnings of a really wonderful revival in rural social life in England. It is not simply an emotion; it has developed into a movement and into an organisation. The National Council of Social Service, which deals both with urban and with rural social questions is in a sense a focal point or clearing house for the work of a great many other bodies which are engaged in social work. Might I develop that to explain a little more definitely what is in my mind? The Council started after the War; it sprang out of the War. It sprang out of the experience of a number of men in Liverpool, Manchester, Birmingham and other big centres, who had been engaged in social work, who felt that it was necessary for voluntary work to have its clearing house as well as statutory bodies. In Liverpool already, there had been what was more than an experiment: a valuable institution had been established known as the Council of Voluntary Aid in Liverpool, which acted as the clearing house for all the many voluntary organisations which were doing work in the City of Liverpool. Similar things had been attempted at one or two other centres; it was felt that what was wanted in local life was also needed in national life, and that it was very important that these great national voluntary organisations, which were every year doing more and more important work, should have their common meeting place and clearing house. That started really on the urban side; but in 1921 and 1922 we had two conferences at Oxford which were attended by representative people from quite a number of counties in England, both voluntary workers and the officials such as the Directors of Education and Directors of Agriculture; the conferences at Oxford were also attended by representatives of the departments here in London which are very largely concerned in rural matters: such bodies as the Ministry of Education, the Ministry of Health, the Ministry of Agriculture and the Development Commission. Out of these two conferences and also out of the experiment which was going on particularly in Oxfordshire, sprang the Rural Community Council movement, which is yet, quite frankly, in its experimental stage. It has got to find its way through, but those of us who are in it believe that if we fail somebody else has got to follow on and do something almost the same; we believe, furthermore, that the organisation which is provided is sufficiently flexible, variable and stimulative to ensure that something of the kind is going to spread all over the country.

53,493. How far is the impulse behind the movement rural, and how far is it a matter of persons mainly urban in their lives stimulating rural life?—I think both elements are there unquestionably, but I believe that the fundamental force is rural; I mean that the real impulse is from the rural side. I happened to listen to what was being said during the examination of the previous witness, and what one feels is that the persons of urban and rural life are very closely related. I am, myself, a case of a man who in one generation has been mainly urban, but my whole ancestry has been rural, and it comes out straight away. I mean this: you will find in the urban areas people who are just as rural as the people in the rural areas, and I think the men and women who have made this movement are people who have always been in touch with the rural side; many of

them have been living most of their lives in the country, others have been living part of their lives in the towns. I could not attempt, without very careful thought, to apportion the influence; but the impulse has been from people who, whether they were living in the town or in the country, really did know about rural life.

53,494. The test comes, I imagine, when you ask your organisation to run without the active support of townsmen: when you ask your village council, or whatever your local unit of village life and management may be, to carry on the movement without help from the towns; have you reached that stage?—I cannot say we have reached the stage yet, because we are still so young; but I will say this, that of course the movement is a movement which is mainly county in its organisation, dealing with the rural side alone. We have the National Council with its Rural Advisory Council, but the local bodies doing the work are the County Rural Community Councils. There are now of these some 17 in this country; that is to say, 17 counties in England and Scotland have taken up the work, and the number in the future is only a matter of strength and ways and means. Then, beneath the county organisation there is, gradually but quite surely building up, the local village organisation; that is the big piece of work which lies ahead. But we have already experience of some of these village councils functioning satisfactorily and my own experience of village life is, that there is reason to expect that they (the village councils) will function.

53,495. What are you hoping to do in the villages?—The National Council is a clearing house; the County Community Councils are also what you might call clearing houses for the organisations which are working in the county. When you come down to the village, your village is being served from that county, on the one hand by increased educational facilities, on the other hand by health work, on another side by recreational work, and in another direction by village industries work. We are trying to get at the village through the interests that the village has; that is a slow job but it is gradually beginning to lift, and if you could take the time to examine, for example, the kind of work which is going on in its small beginnings in Kent or in Oxfordshire, you would see just how it is beginning to touch the village. You will find that a village here and there is getting really interested, and other villages we hope will follow.

53,496. *Sir Thomas Middleton*: Can you illustrate the kind of work with reference to the Village halls movement?—That is one side of it; the Village halls side of our work is yet very limited; but we have taken up the problem experimentally in some counties of trying to survey carefully what there is in the way of village halls, village clubs and so forth in the area, and, through assistance given from the Development Commission, we have made available certain loan assistance for the establishment of village halls; but that is only a very small thing. The big work which is being done is the work of helping the educational, the health, the recreational, and to a certain extent the rural industries interests of the village.

53,497. *The Chairman*: What have you actually achieved in the educational field?—I can only say, if you want facts and figures, I am sure the Secretary can give you as much as you will desire on that side; but if you take any county, what happens there is this: You will find in the Rural Community county itself a panel of lecturers, a list of people who can go out to give assistance in concerts; that is the sort of clearing house it is. The Rural Community Council in the county is the centre for providing, for the villages that want them, lectures or concerts, or arranging for a drama society to go down there. It is the centre to which a village can turn and say: "Can you help us to get this or that?"

53,498. Is the demand mainly for adult education?—So far, yes. It is very important to get this point quite clear, that the County Rural Community Council is a group, a number of organisations. You have the Women's Institutes on the one side, you have the Y.M.C.A. let us say on the other; you have the Nursing Association and many other local associations. What the Rural Community Council does is to put these associations into closer touch with any particular village which wants to get a particular service.

53,499. *Professor Gangulee*: What is the relation of your Council with the Parish Council?—There is no statutory relationship; the Community Council is an entirely voluntary body; but what happens is this, that in Kent, where there has been most development in this field, in several cases Parish Councils have helped to get these village community councils established, and in general the object of a village council or of a county rural community council is to work in as close co-operation as possible with the local statutory body. It is not represented on that statutory body, but the statutory body is very often represented, and naturally so, in county community councils.

53,500. *The Chairman*: Are you making much of music?—Yes.

53,501. How about village industries?—There is a very great development going on in that field; the Rural Industries Bureau is the centre of that work, but the rural community councils usually have one of their committees devoted to this side, and the Rural Industries Bureau works in co-operation with the rural community councils.

53,502. Up to the present has it been more a matter of developing craftsmanship on the part of village tradesmen than introducing or fostering whole or spare-time occupations? Do you follow the distinction?—Yes, I do. I think you have got the two sides: you have got, on the one side, people like the blacksmiths, wheelwrights and so forth, whose crafts are being developed largely in connection with the Rural Industries Bureau and under the county committee or under the rural community council, directly helping in that. On the other side you have a great deal of work being done by the Women's Institutes in the field of what you might call the little industries: the glove-making and all kinds of home industries, basket-making and so forth. You have two sides: you have the old customary trades like that of the wheelwright, the blacksmith, and so forth, and on the other side you have the home women's industries, as you might call them.

53,503. *Sir Henry Lawrence*: I understand you are also acquainted with the development in Ireland?—Yes, I have served there.

53,504. You are acquainted with the agricultural organisation and co-operative work there?—I was in the Irish Department of Agriculture for five years, from 1905 to 1910, before I came to Oxford; I was, of course, never in the agricultural co-operative organisation, which was distinct, but I saw its work very very closely, and have remained in close touch with it.

53,505. *The Chairman*: In the Dublin Department you mean?—Yes.

53,506. *Sir Henry Lawrence*: Has that work regained at all its position since the recent troubles? Is any good work being done there now, do you know?—Yes, I think so, and what is happening there now is very remarkable; I cannot give you the details of it, but the present Government in Ireland, or the Government which has been in office, has recently passed a very remarkable Co-operative Act dealing with the creameries; it is practically taking under control the whole creamery organisation, as I understand. It is shutting up what are called redundant creameries and is going to make much more stringent provision for the co-operative organisation of Ireland.

53,507. For grading milk and so on?—Yes, everything of that kind.

53,508. *Professor Gangulee*: They have bought outright the non-co-operative creameries?—Yes, the proprietary creameries.

53,509. And have handed them over to the co-operative agencies?—Yes, there is a very big scheme and a very complex scheme; it is subject to certain conditions of support for its carrying out.

53,510. Is any advance being made in the improvement of rural industries under the present system in Ireland?—I think very little, but I have only the knowledge of one who happens to go back to Ireland every year. I think there is, on the whole, very little in the way of rural industries apart from things like lace-making and these industries which were developed in the congested districts. I think there is very little either of that or of what you might call community work similar to what is being done in England. If I may say so, it is very remarkable that this work is being done in England, and is only gradually beginning to spread to Scotland, Wales and Ireland. I say it as a Scotsman, England has been really the missionary centre in this matter, and I think it is going to have very far-reaching effects overseas.

53,511. *Sir Henry Lawrence*: Does the Irish policy aim more at developing the agricultural side than the industrial side?—Yes; they have, of course, in their Ministry of Commerce, a very active Minister, and they are hoping, I gather, to develop the industrial idea as well. Part of the Shannon scheme is to help industries.

53,512. *Dr. Hyder*: I have listened to your remarks with very great interest and I just want a little information. You say part of the work consists of lectures which are delivered to these people in the villages; what is it you talk about to these villagers?—The range is extraordinarily wide.

53,513. Do your subjects relate to life in and round about a village, or do they refer to subjects which are outside the village life?—They may be quite outside the village; it depends largely on the demand from the village. For example, you will find a village asking for a lecture on the League of Nations, wanting to understand what it is. On the other hand, you will have a lecture which is simply on some purely literary subject, or you may have a lecture of the most practical character, on agricultural work or domestic work.

53,514. Your idea is to make village life richer and fuller and to make it happier?—Certainly, and to make it more self-acting; I mean to stimulate them to do things for themselves, to improve their health and improve their education.

53,515. What is this idea about village halls?—Very often, in the village there has been no proper place for meetings or for recreation; the movement has made very considerable headway in recent years.

53,516. That serves as a sort of club?—To provide a meeting place.

53,517. *Mr. Calvert*: You say there is no proper place; do you mean non-sectarian?—No, I was not thinking of that; I mean really there was not a place to go into; there might be a school, but a school with all its desks is not really a suitable place for meetings. Villages vary very greatly in this respect.

53,518. *Dr. Hyder*: Have you got many villages in England?—I cannot tell you how many; there are a tremendous number.

I request that you should give me the name of a village which I may visit.

53,519. *The Chairman*: Would you like to reserve your answer to that?—Perhaps you would explain a little more fully what kind of village, because the range of selection is enormous.

53,520. *Dr. Hyder*: With regard to the industrial work which is carried on, I understand that you concentrate attention on the village blacksmith, the village wheelwright, and, with regard to the work of women, on lace-making?—Lace-making is with reference to Ireland.

53,521. I was asking some Irishmen whom I met what their view was of the success of this lace-making, and they said that hand-made lace could not

stand against the competition of the machine-made article; is that so?—There has been a great deal of depression in the lace trade, there is no doubt about that; but I think good Irish lace always holds its market though the demand may fluctuate. But I have not the knowledge of the actual economic position of the lace-making industry in Ireland at the present time.

53,522. *Professor Gangulee*: Your work of rural reconstruction amounts to a form of adult education, does it not?—That is a very big element in it, but you will also bear in mind that this is a very complex thing; there is a very great Youth movement in it as well; there are the Boy Scouts and the Girl Guides. Then there is the Young Farmers' Club movement. That is the young movement which is just beginning, but which has a very big future in England as well as in Canada. These are some of the other elements of the movement; it is not merely adult education.

53,523. This idea of Rural Community Council is a post-War development?—It has developed much more since the War.

53,524. Did the impulse come from the Church, from the political parties or from the Universities?—It did not come from any of them; I should say it came almost from a hundred sources. Many people who were living in the country simply felt that they must have something better; University people, business people, farmers, labourers, landlords: all kinds of people joined in making this movement.

53,525. The party organisations in this country did not have anything to do with its development?—No, it has had nothing to do with the political side; but recently the Government have expressed their sense of the importance of this side of the work.

53,526. From where have you got your funds for these organisations?—Mainly from voluntary sources, but we have also had very great help from the Carnegie United Kingdom Trustees; that is a big voluntary foundation in this country, which has helped very considerably the county rural community councils.

53,527. The nature of your work in rural areas is not quite clear to me; you say you help rural sanitation and education; what do you mean when you use the word "help"? What do you actually do?—Take the question of education; we work in the closest touch with the county authorities. We help to get their work better known, we help to do a great deal of work which they cannot touch, particularly this youth work and adult work. We attempt to supplement the work of the statutory authorities.

53,528. Are the workers, engaged under your scheme, paid or voluntary?—They are nearly all voluntary workers. The Secretary of a County Community Council is a whole-time officer and paid. But this is not so in all cases; in Oxfordshire, for example, we have an unpaid secretary. It is necessary as a rule to have somebody who is able to give his time to what is really now a very complex piece of work. There is also some paid clerical assistance, but a great part of our staff and service work is unpaid.

53,529. And most of your workers are recruited from University centres?—Not from those only.

53,530. From the high schools?—No.

53,531. Where do they come from?—They are very largely men and women who are living in town or in country; they may have been to the University or they may have not. They are drawn from all classes and occupations.

53,532. *Mr. Calvert*: Is the Horace Plunkett Foundation in London now doing any great work?—I think it is; it also has only been actively at work since the War. The Wembley Conference of 1924 was one great step in its development, and this year it has produced the second survey of agricultural co-operation in the British Dominions. I brought these books in case they are not known; I think they ought to be known to the Commission. Here is the Year Book of Agricultural Co-operation in the British

Empire. That is one of the first fruits of the work which has been done by the Foundation.

53,533. You seem to have some suggestions to offer about training in agricultural economics?—What I had in my mind there was this, that from my own experience of seeing agricultural education in the universities and colleges and elsewhere, I think the economic side has not until recently been receiving anything like adequate attention. Just as in agricultural development the economic problem is at the heart of it, so in agricultural education I feel very strongly that the economic aspect, particularly with regard to costs of production and problems of distribution, should be very clearly in the minds of the people framing our agricultural curricula, they have not been, sufficiently, in the past.

53,534. Apart from the history of agriculture, on which a tremendous amount has been done in England, is any systematic study of the principles of rural economics going on?—Yes, there is now; there is systematic study of it both at Oxford and at Cambridge, and I think at many others of the colleges in England and Wales. If you were to look into the Scotch and Irish schools and colleges, I think you would find the same thing happening there; there has been a very great advance in the whole field of careful costing work and economic surveying work. One of the difficulties I had in mind with regard to economics was getting men who could really do this work of proper economic investigation and survey; you have to train men for that purpose.

53,535. But there are not published, in England, any books on systematic rural economics comparable to what has been done in Italy, France and Germany?—Yes, the book by Dr. Venn, of Cambridge, on agricultural economics is a comparatively recent issue, and you have a whole series of reports from the Institute of Research in Agricultural Economics at Oxford There is Dr. Ruston's work, and that of Wylie, who used to be in the West of Scotland, is another one.

53,536. You could hardly compare those with the American work, could you?—Yes, I would. The American work is extraordinarily unequal. There is a tremendous range of it. We cannot compare with it in quantity, but I think there is absolutely as good work being done now in the field of agricultural economics in this country as is being done anywhere else. I have seen a good deal of the American work.

53,537. *Professor Gangulee*: The work of the Oxford Institute is more intensive than extensive?—It is very intensive.

53,538. For instance, you have undertaken to survey the County of Oxford?—Yes; but the work which has been most striking has been the real attempt to lay the foundations of proper comparative costings.

53,539. *Mr. Calvert*: That is only one section, of course?—But it is a fundamental section; it is absolutely fundamental. When we had to face the Corn Production Act in this country, I remember how ignorant we were about the whole problem of what agricultural costs really were. Until we know something about the comparative costs we shall all the time fumbling in the dark.

53,540. We recommend this report by you and Sir William Ashley, and we have bought a copy for every member of our staff, but, on the general principles of rural economics, there is no book that I know published in England? Would you rather take one of the American textbooks?—Yes.

53,541. *Professor Gangulee*: I think Mr. Calvert has in mind something like Mr. Carver's book on the principles of rural economics?—Yes, I know it.

Mr. Calvert: There is in England an extraordinary lack of understanding of the basic principles.

53,542. *Mr. Calvert*: You propose to have a training in rural economics as an important aspect of school education?—Yes, I think you have to think out the economic problem right from the very early stage when you

enter into agricultural education. As an example of that, I would point to the work of such organisations as the young farmers' clubs which seem to me to be a clear confirmation of the wisdom of that principle. It is amazing to see what the young farmers' clubs have done in the United States, Canada, and even a few of them in this country. The way in which they are teaching economics is not by giving lessons in economics, but by really grounding the boys and girls in good economic work and principles.

53,543. *Professor Gangulee*: You are referring to Sir Henry Rew's movement?—No, you are thinking of the village club movement. What I am here speaking of is the Young Farmers' Club movement which has come over from the United States and Canada, which teaches boys and girls from the age, some of them, of under 10, though most of them are from 10 onwards. It may be a calf club, a pig club, a poultry club or a rose club, but they have got something or other which they are producing and which they are selling.

(*The witness withdrew.*)

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Agriculture and Science.*

The application of science to agriculture is a comparatively modern development. Since 1834, when Boussingault laid the foundations of agricultural chemistry, an increased and increasing amount of attention has been devoted to agriculture by men of science. I propose briefly to recapitulate some of the more important advances which have resulted from this impact of organized knowledge on the most ancient of the arts and then to deal in greater detail with some of the agricultural problems of to-day in the solution of which science is certain to play an important part. In reviewing the development of agricultural science, two things must be kept in view—the influence of science on practice and, what is perhaps more interesting, the lessons which agriculture has taught and is still teaching the scientific investigator. I hope to show that the great benefits that have flowed from the application of science to practice are not always on the side of agriculture, but that scientific method itself has sometimes profited from the association. Further, the man of science has had to realize that progress is possible without the aid of science and that some of the greatest developments in agriculture, even at the present day, have been brought about by empirical means.

Examples of notable advances in agriculture which have taken place without the aid of science are to be found all over the world. In the Orient, perhaps the most remarkable is the cultivation of rice which has been developed by the people in the deltas of the great rivers to a high degree of perfection and carried up the slopes of valleys by means of a system of irrigated terraces. The care and skill which have enabled the cultivator to grow a semi-aquatic crop like rice on the steep hillsides of India and Ceylon cannot fail to command our attention and respect. In this development, science has played no part, and even now has not completed the preliminary analysis of the factors involved in the growth of the chief cereal of the tropics. We can only guess at the sources of the nitrogen made use of by the rice plant. Again in Gujerat in this Presidency, an indigenous system of agriculture has been evolved to overcome a most difficult set of soil and moisture conditions. In order that the tilth may be maintained and the moisture con-

* Presidential address to the Thirteenth Indian Science Congress, January 1926.

served speed is essential in managing these soils. To get over the fields quickly, the crops are grown in straight lines; simple but effective implements have been designed for sowing and inter-culture and a fast and powerful breed of oxen has been developed. The adaptation of means to end is remarkable and great natural obstacles have been overcome by the peasantry unaided. In the Occident, equally striking advances have been made by empirical means. Subsoil drainage, the modern systems of tillage, the great progress which has been made in the breeding of live stock, the Norfolk four-course system of rotation—which followed the introduction of the turnip crop into Great Britain in 1730—are all improvements which owe nothing to the scientific investigator.

The early pioneers of agricultural science were chemists. A French chemist laid the foundation stone in 1834. Liebig's classical monograph on agricultural chemistry appeared in 1840 which instantly attracted the attention of agriculturists who, for the first time, were made acquainted with the help they were likely to obtain from the application of chemistry to the tillage of the soil. Three years later—in 1843—the Rothamstead Experiment Station was founded by Lawes and the great era of agricultural chemistry began which continued till the end of the last century. During this period agricultural science was a branch of chemistry. As long as the Liebig tradition endured, the analyses of soils and manures were regarded almost with veneration by the practical man, and great hopes were entertained that something approaching a royal road in the development of agriculture had been discovered. This phase lasted nearly fifty years, during which the use of artificial manures became firmly welded into the agricultural practice of the West. Experience of the new science, however, gradually showed that improvements in crop-production could not always be achieved by applying the principles laid down by Liebig. The deficiencies in the soil, suggested by chemical analysis, were not always made up by the addition of the appropriate artificial manure. The feeling slowly developed that the problems of crop-production could not be dealt with adequately by chemistry alone. The physical texture of the soil was found to be as important as its chemical composition. The pioneering work of Hilgard and King in America led to the development of a new branch of the subject —soil physics—the exploration of which is still in progress. Pasteur's work on fermentation and allied subjects discovered a new world and laid the foundation of the modern work on micro-organisms and disease. The soil was soon found to be inhabited by bacteria and other forms of life and a new branch of agricultural science—soil bacteriology—arose. The organisms concerned in the nitrification of organic matter in the soil were discovered by Winogradsky and the conditions necessary for their activity were determined. Hellriegel and Wilfarth worked out the rôle of the organisms which produce the nodules on the roots of leguminous plants, and in 1888 furnished a scientific explanation of the value of these crops in enriching the soil. The Liebig conception of soil fertility was thus gradually enlarged, and it became clear that the problem of increasing the produce of the soil did not lie within the domain of any one science but embraced at least three—chemistry, physics and bacteriology. The great value of this broadening of the basis of agricultural science was to afford an explanation of practices which had been arrived at on the basis of experience and to add a number of important principles to the subject. It was not till the beginning of the present century that investigators began to pay attention to what is after all the chief agent in crop-production, namely, the plant itself. The rediscovery of Mendel's law by Correns, the conception of the unit species which followed the work of Johannsen and the recognition of its importance in improvement by selection have led directly to the modern botanical studies of cultivated crops. These investigations are constantly broadening, and now embrace the root-system and its relation to the soil type as well as resistance

to disease. It is an arresting fact that the development of modern plant-breeding came about indirectly and did not arise in the most logical manner, namely, as an outgrowth of systematic botany and the intensive study of the Linnean species. Had the principles of systematic botany been rigorously applied to the various units which make up the Linnean species and had anybody collected the numerous forms of almost any wild plant and grown them side by side from single plants, the principles underlying improvement by selection would have been apparent and a sure foundation for modern plant-breeding would have been laid.

The practical results which have followed the application of botanical science to agriculture during the last quarter of a century are very considerable. In wheat, for example, the labours of Saunders in Canada culminated in the production of Marquis—a variety obtained by crossing Red Fife with an early Indian wheat (Hard Red Calcutta). Marquis closely resembles Red Fife in appearance in the field and in the high quality of its grain. It differs from the parent in earliness and in having a shorter straw. Marquis is the most successful hybrid yet produced. Over 20,000,000 acres of this variety are grown in Canada and the neighbouring States of the Union. In Australia, the new wheats raised by Farrer are widely cultivated. In England, Biffen's new hybrid Yeoman has definitely established itself in the wheat-growing areas of the country. In India, the types produced by the Pusa Research Institute already cover more than 2,000,000 acres. The total area of the new varieties of wheat produced during the present century must be little short of twenty-five million acres. At a moderate estimate, the increased wealth produced by the application of modern methods of plant-breeding to this crop must be at least 20,000,000 sterling a year. If this annual dividend is compared with the capital invested, the return is many times greater than that yielded by the most successful industrial enterprise. The methods which have proved successful in wheat are now being applied in India to crops like cotton, rice, jute and sugarcane, and important results have already been obtained. During the next generation, the replacement of inferior varieties by more efficient and higher yielding types is certain to make rapid progress, and in a few years the total annual addition to the wealth of the world will run into hundreds of millions sterling. Important as is the total annual increment which follows the general adoption of a successful variety, nevertheless the gain per acre is small. Even in the most favourable circumstances it is not likely to exceed twenty rupees an acre. As in the case of Marquis and the Pusa wheats, the advantage is partly due to earliness and partly to the improved quality of the grain. The new varieties are more efficient and make better use of the food materials provided by the soil than the old. Their cultivation secures a more certain crop and also one of increased market value. It by no means follows that the new kinds require more from the soil and that their cultivation will be followed by a loss of permanent fertility. The improvement is closely similar to that obtained by replacing an inefficient machine by one which is better designed to do the same work.

Even when the cultivated area of the world has been provided with better varieties, only the first instalment of the practical results, which flow from the modern studies of crops, will have been secured. The great problem of the agriculture of the near future is the intensive cultivation of improved varieties by which the present production can be vastly increased in quantity as well as improved in quality.

A survey of the development of agricultural science during the last ninety years reveals the important fact that until quite recently the approach has almost always been by means of one science. The researches fall into classes, each class coinciding with the limits of some well-defined subject like chemistry, physics, bacteriology, entomology or botany. Not only can the researches be easily grouped, but the organization of agricultural workers

closely follows the artificial sub-division of science which has grown up in the colleges and Universities as a result of the exigencies of teaching and examinations. Further, the history of the application of each science to agriculture follows much the same course. First of all there is a period of optimism after the publication of the early results. This is slowly followed by a more chastened outlook as it becomes apparent that the new science is not quite adequate by itself to deal with the many-sided problems of practice. Finally, direction is gradually lost and the effort not infrequently loses itself in detail.

I propose at this stage to examine two of the chief problems which now confront the agricultural investigator in India, and I hope to show that these problems do not fall within the limits of any single branch of science. It naturally follows therefore that the conventional method of attack cannot hope to be completely successful.

Irrigation and Agriculture.

The discovery of the right use of irrigation water is one of the chief tasks now before the Agricultural Department in India. As every one knows, everything goes well in this country if the rains are timely, well distributed and ample in volume. Trade flourishes, there is contentment in the villages and in due course the officials connected with finance have the pleasant duty of announcing either the remission of taxation or suggesting useful schemes on which the surplus revenue can be spent. All this follows because water is one of the limiting factors in the growth of crops. Hence the development of canal irrigation from rivers to supplement the rainfall. At first sight, all that seems needed is that the engineers should dam a river and distribute the impounded water over the country-side according to a time-table. The factor—shortage of water—which limits production can in this way be removed. For the canal to pay its way and to bring in the greatest revenue, the water has to be distributed so that the most expensive crops like cotton and sugar-cane can be grown. This involves fairly frequent waterings so that there is no cessation of growth between sowing and harvest. Hence the institution of perennial irrigation and the concentration of the cultivated area commanded so that the highest duty of the water and the maximum revenue can be obtained. When, however, we carefully compare the growth of the same crop under canal irrigation and under normal rainfall, interesting differences can at once be detected. The irrigated crop as a rule does not appear to be quite at home. Ripening is frequently delayed and the quality of the produce is apt to be irregular and inferior. Further, the standard of cultivation under a canal tends to deteriorate. After a few years, the producing power of the soil falls off; patches of alkali land often appear and grow in size and there is a tendency for the villages to become malarious. Compared with the best well-irrigated regions or with localities where the crops are grown on the natural rainfall, the well-being of both plants and animals on the perennial canal leaves a good deal to be desired. Canal irrigation in the hands of the cultivator seems to put a brake on the wheel of life. In some places, as for example on the Nira canal in Bombay, the wheel of life is brought to a standstill altogether by the land becoming a wilderness of alkali on which nothing can grow. Here the canal has produced dead soil. How is it that things have gone wrong and why is there this difference between experience and theory? The answer is to be found in the fact that rainfall and canal irrigation are different things from the point of view of the plant. It is true that rainfall and irrigation have one factor in common, namely, the provision of water. In almost every other respect, however, they are quite different. Rain is a saturated solution of oxygen in water and usually reaches the soil so slowly and at such long intervals that it does not destroy texture to anything like the same extent as canal water does. Moreover, it supplies the

soil with oxygen in a highly effective form. Canal water is much poorer in oxygen, it destroys the tilth and the total period of its application to any particular crop is only a matter of an hour or two. Further, when the surplus irrigation water cannot flow away underground there is a gradual rise of the subsoil water-level which may reach almost to the surface. Small as these differences at first sight appear, nevertheless they are sufficiently important in the course of a few years to bring about a marked fall in the fertility of the soil.

Why there should be such a tendency towards intense malaria, when dry crops are grown under canal irrigation, is a matter which has not yet been satisfactorily explained. Is it merely due to the accumulation of surface water providing breeding grounds for mosquitoes or is a part of the answer to be found in the lowered resistance of the people? Have the wheat and other food-grains, produced under canal irrigation, the same food-value as those grown under natural rainfall or with the help of wells? Do the nutritive and vitamin values of food-grains vary with the conditions of their growth? Science cannot at the moment answer these questions but these are indications that the food value of the same cereal depends on the conditions under which it is grown. This matter urgently calls for careful investigation. McCarrison[1], working in Madras, was on the eve of throwing light on these questions when his researches were brought to an end by retrenchment. During the course of an exhaustive enquiry into the food value of the rices in common use in India, this investigator found the various kinds differed considerably in nutritive value. No reason for this could be detected in their chemical composition and it appeared that the differences might be due in part to their vitamin content. As rice was not available at the moment, the matter was put to the test of experiment using the same kind of millet from the permanent experimental plots at the Coimbatore Experiment Station. These plots have been in existence about fifteen years and have been manured in various ways. In the feeding experiments on animals, the millet grown on soil manured with cattle manure was more nutritious and contained more vitamins than that grown on soil manured with artificial manure; that grown on exhausted soil being the worst of all in these respects. McCarrison writes, " I was in the middle of this work when my researches came to an untimely end owing to financial retrenchments in India so I was not able to repeat the experiment nor to extend them to other grains." That there does exist a definite relationship between the incidence of malaria and the way crops are grown is suggested by the observations of Bentley in Bengal. In this Province, the prevalence of malaria and the inundation of the rice areas are closely connected. In such tracts as Eastern Bengal, which are subject to annual inundation, the rice crops are excellent, there are practically no waste lands, the population is large and malaria exists to so slight an extent as to be almost negligible. In parts of Central and Western Bengal, however, quite a different state of things exists. The greater part of the Districts of Nadia, Murshidabad, Hooghly and Burdwan have been deprived of the natural inundations to which they were once subject by the construction of river-embankments. In the old days, 60 or 70 years ago, these embankments were kept in such bad repair that they did not prevent flooding of the country and their harmful effect was not apparent. When they were made really efficient barriers to the inundation, the protected areas began to suffer in several ways. The fertility of the soil diminished, the area of waste land increased, population declined and with it malaria increased to an appalling extent. Where rice is grown to perfection there is little malaria; where the crop is cut off from the necessary inundation, malaria is rife. In all probability the same rule applies to dry crops like wheat. It may easily prove to be that the intense

[1] *Jour. Roy. Soc. of Arts*, LXXIII. 1925, p. 152.

malaria which often follows in the wake of the canal in North-West India is not altogether due to the mosquito but is a consequence of the lowering of the quality of the food-grains grown under canal irrigation. The subject is one which calls for early investigation and it is hoped that McCarrison's interesting work on the influence of soil conditions on the nutritive value of the chief food grains of India will be continued and that the investigation will be widened to embrace the effect of the quality of wheat on resistance to diseases like malaria.

Of equal importance to the increase in malaria is the deleterious effect of canal irrigation on the fertility of the soil. When the desert is conquered by the canal, all goes well at first and large crops are raised with a comparatively small volume of irrigation water. As time goes on, however, the soil particles fall into a condition of closer and closer packing and as the natural texture of the desert soil is lost, more and more water is needed by the cultivator to raise his crops. Defective soil-aeration soon becomes a limiting factor in growth. The yields begin to fall off with surprising rapidity as is shown by the results with wheat at Mirpurkhas in Sind. The next stage is the appearance of alkali patches which slowly increase in size till the land goes out of cultivation. The rate of transformation of potentially fertile desert soil into useless alkali land is, other things being equal, inversely proportional to the size of the soil particles. Open, porous soils are not affected to any great extent by perennial irrigation. Close, heavy soils, containing a high proportion of fine particles, are, however, particularly prone to develop the alkali condition

Very little progress in the prevention and cure of alkali soils has been made up to the present in India. All attempts to reclaim these soils on the large scale have proved to be impossible on economic grounds. Further, almost nothing is known of the causes which produce the alkali phase. The conventional view that alkali soils are the natural consequence of a light rainfall, insufficient to wash out of the land the salts which always form in it by the progressive weathering of the rock powder of which all soils largely consist, is persistently reiterated. Hence alkali lands are considered to be a natural feature of arid tracts like the Punjab and Sind where the rainfall is very small. These ideas on the origin and occurrence of alkali land, however, do not correspond with all the facts. Alkali soils are common in the sub-montane tracts of North Bihar where the rainfall is between 50 and 60 inches. Arid conditions, therefore, are not essential for the production of these salts; heavy rainfall does not always remove them. What does appear to be a necessary condition is defective soil-aeration. Whenever the air supply is cut off by the constant surface irrigation of stiff soils or by other causes, alkali salts sooner or later appear. If these barren areas are examined, they are frequently found to contain the bluish-green markings which are associated with the activities of anaerobic bacteria. These organisms appear to bring about a reductive phase in the soil which involves the formation of substances like sulphuretted hydrogen and the metallic sulphides. When circumstances alter and oxidation again takes place, the salts of alkali land—the sulphate, chloride and carbonate of sodium—are produced. That the origin of alkali is due to defective soil aeration which slowly establishes an anaerobic soil flora is supported by a large number of facts and observations. In the alkali zone of North Bihar, wells have to be left open to the air, otherwise the water is contaminated by sulphuretted hydrogen, thereby indicating a well marked reductive phase in the deep soil layers. In a sub-soil drainage experiment in the Nira valley, Mann and Tamhane found that the salt water which ran out of these drains soon smelt strongly of sulphuretted hydrogen and a white deposit of sulphur was found at the mouth of each drain, proving how strong was the reducing action in this soil. Here the reductive phase in alkali formation was actually demonstrated. After drainage and aeration were established, the

conditions necessary for alkali production were removed and the original texture and fertility of the soil were restored. These and many other examples point to the supreme importance of further investigation of the origin of alkali lands in India and the discovery of the conditions which are necessary for their formation. Once this is known, it will be possible to shape our irrigation policy so that the water can be made use of without lowering the permanent fertility of the country-side. Such an investigation is particularly necessary in India at the present time in view of the pending development of canal irrigation in Sind. A barrage is being thrown across the Indus below Sukkur, and a system of intensive perennial irrigation was at one time contemplated for the growth of crops like cotton and wheat. The soil, however, is much closer in texture than that of the Canal Colonies of the Punjab, there are no deep sand layers to assist percolation, and the level of the subsoil water is comparatively near the surface. There is, therefore, every reason to fear that the soil conditions of the area commanded by the Sukkur barrage are such that intensive perennial irrigation will produce a vast expanse of dead alkali land.[1] Such a disaster can probably be averted by altering the method of distribution so as to give the land as much rest as possible from irrigation. A new method of irrigation must be evolved (intermediate between the modern perennial system and the old basin method) by which irrigation and soil-aeration can be combined. This is one of the results which is expected from the new Irrigation Experiment Station in Sind which has just been sanctioned by the Government of Bombay.

The effective addition of water to make up for a deficient rainfall is therefore not a simple matter. It lies far outside the province of the engineer and embraces not only the health and well-being of the people but also the main facts of rural economy as well as the problem of the maintenance of the fertility of the soil. Such questions do not fall within the limits of any one science and it is obvious that their solution can only be accomplished by investigators of great experience, capable of bringing several sciences simultaneously to bear on these problems.

Diseases of Plants.

When we turn to the biological aspects of agricultural work, the great complexity of the subject and the interaction of the fields, covered by the separate sciences, become most apparent. In following the growth of a crop from the seed, many branches of natural science are involved. The food materials provided by the soil are prepared by bacteria; drawn into the plant and transported by physical means; elaborated into useful products by chemical processes while the resulting growth produces organs which are studied by the botanist. Biological questions are therefore a complex of all sciences. Many of the problems of agriculture, particularly in the tropics, centre round the growth of the plant. How closely this complexity influences the successful solution of agricultural problems is seen when we consider the diseases of plants.

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[1] In his *Irrigation and Drainage* (London, 1900) King concludes an interesting discussion of this question in the following words, which deserve the fullest consideration on the part of the irrigation authorities in India. "It is a noteworthy fact that the excessive development of alkalies in India as well as in Egypt and California, are the result of irrigation practices modern in their origin and modes and instituted by people lacking in the traditions of the ancient irrigators who had worked these same lands thousands of years before. The alkali lands of to-day, in their intense form, are of modern origin, due to practices which are evidently inadmissible and which in all probability were known to be so by the people whom our modern civilisation has supplanted."

In recent years perhaps more attention has been paid to the diseases of crops than to any other branch of agriculture. One reason for this would appear to be that the detailed examination of the insects and fungi concerned in plant diseases can easily be carried out by specialists in an ordinary laboratory and do not involve much equipment. In spite of the vast literature on diseases which has accumulated as a result of the researches of the last thirty years, agricultural practice has been remarkably little influenced. This result at first sight appears surprising. It seems so obviously the right thing to ascertain the nature of the pest and to attack its weakest and most vulnerable phase. It is, however, now being recognized that direct attack by assault and battery is nearly always useless and economic entomology and mycology are becoming transformed into plant pathology, thus bringing these subjects into line with the new developments in medical thought.

The moment we begin to study the diseases of plants from a broad standpoint it becomes apparent that a great deal besides the life-history of the fungus or of the insect is involved. The variety of the particular crop is perhaps more important than the parasite and the effect of the invironment on both is often very considerable. That the insect or the fungus is only one factor in the problem is seen when large numbers of unit species, belonging to several varieties of a crop like wheat, are grown side by side under similar conditions for a number of years. The resistance of the unit species to the various rust fungi differs widely. Some unit species are practically immune, the rest are attacked to varying degrees. Although there is always plenty of infecting material, the immune types escape.

It has not yet been possible directly to discover on what the immunity of certain species, varieties and unit species depends but some light is thrown on the subject by another set of observations. It has frequently been noticed that improper methods of agriculture are almost certain to be followed by attacks of disease even in cases when the variety possesses a fair degree of disease resistance. Moreover, it has been found possible to induce experimentally attacks of disease by altering the conditions of growth. Thus einkorn (*Triticum monococcum* L.), the most rust resistant species of wheat known, became covered with pustules of black rust (*Puccinia graminis* Pers.) when grown during the hot season at Pusa. By altering the time of irrigation at Quetta, peach trees could be covered with green-fly while neighbouring trees of the same variety, watered normally, remained free from this pest. Researches in other parts of the world tend to show that this and allied results follow alterations in the chemical composition of the cell-sap brought about by changes in the general metabolism induced by the altered methods of cultivation. The pest will only become acute if certain substances are present in the cell in quantity—a close parallel with the recent work on cancer in Great Britain.

Twenty-five years ago detailed studies of the insect and fungus diseases of the sugar-cane were the chief feature of the work of the sugar experiment stations in java. These are now no longer considered necessary as experience has shown that the best method of dealing with sugar-cane diseases is by the efficient cultivation of suitable varieties. To grow the right kind in the right way is found in practice to be the most important factor in the control and elimination of the pests of the sugar-cane. This experience is most significant. The Java sugar industry is perhaps the high-water mark of tropical agriculture and owes its present position to various natural advantages which have been developed to the utmost by the efforts of a succession of highly qualified scientific investigators who have explored, in the greatest detail, the various directions

in which the production of sugar can be increased. It is most significant that as the investigation of sugar-cane diseases became broadened and included all the factors, direct methods were given up and attention was directed solely to the variety and to its proper cultivation. This is after all only common sense. Disease follows the breakdown of the normal physiological processes in the plant when the protoplasm of the cells loses its power of resistance to the inroads of parasites. Healthy plants, on the other hand, possess a high degree of immunity to insects and fungi. It is obviously more practical to prevent disease altogether by growing the right kind in the right way than to step in at the last moment and attempt to save a moribund crop.

The problems which centre round irrigation and disease are typical of those which now await solution by the man of science. They are not simple questions and they do not lie within the limits of any one branch of science. Each involves a number of factors and it is obvious that the method of approach by means of the single science cannot hope to do more than accumulate data which may or may not be useful to some master-builder of the future. The approach by way of the single science is really an inheritance of the Liebig phase when agricultural chemistry and agricultural science were synonymous. As the subject broadened and deepened, first one and then another science became involved with the consequence that workers in these various branches of knowledge became colleagues of the agricultural chemist. The literature dealing with investigation and the teaching in the colleges and Universities naturally followed the separate science. When about thirty years ago Departments of Agriculture began to make their appearance in various parts of the Empire, the organization was modelled on the teachings of the colleges and the staff usually included a chemist, a mycologist, an entomologist, a bacteriologist and a botanist. As research extended, progress has always been marked by the addition of specialists whose business it was to deal with the application of some particular science to agriculture. Meanwhile the real subjects of research have far outgrown the old tradition founded on Liebig's work, and the attack by means of the single science is no longer adequate. Some new method must be devised by which science can be more fully utilized in the advancement of agriculture. If we continue as at present the organization itself will soon become a bar to progress. The immediate question is: Is there any method other than that of the single subject by which science can deal with the problems of the cultivator.

How is the difficulty to be solved and how can science be brought to bear in a more effective fashion? Several suggestions have been made of which it is proposed to discuss two, namely team work and a widening of the training of the investigator accompanied by a gradual re-organization of existing agricultural departments. The idea of team work in the solution of agricultural problems is a comparatively recent one and is a recognition of the complexity of present day problems. Team work is another name for co-operation by which workers in single sciences can join forces to attack a complex question. It is a useful method for research institutes at which a number of graduates are working as apprentices in methods of research. By this means the post-graduate student not only has the opportunity of using his own knowledge but also comes in contact with the essential nature of large questions. In agricultural research it is an excellent method for certain centres at which experienced investigators can direct and co-ordinate the efforts of advanced students. At the most, however, team work can do little more than make the most of a bad job. It breaks down when the members of the team are isolated and are placed face to face with problems in the strange places of the earth, where the sheltered corners created by the Universities

and by the endowed experiment station do not exist and where the working conditions can be summed up briefly in the three words—*payment by results*. Further, team work does not help to make investigators who can stand on their own feet. It rather tends to provide a framework for accommodating the unit very much as a regiment does. Another disadvantage is that to be effective team work always requires somebody to lead the team and to maintain direction. It also needs suitable material to lead. Team work in other countries is no new thing. It has long been common in the Universities of the Continent where recognised leaders are frequently surrounded by young graduates eager to learn how to make the best use of their knowledge. At many of the Continental Universities, team work was in operation long before the term began to appear in our own literature. It is however in the study of biological problems that team work is most likely to fail. As emphasized above, the growth of a living organism like a plant involves many of the natural sciences and it is difficult to see how team work is to give that insight into vital processes without which all such research remains sterile. A successful biological investigator must be able to visualise the complicated processes taking place in a plant and to realise that such processes do not take place independently but that each influences the other. That this is being recognised is shown by the modern development at the universities of border line subjects like bio-chemistry but what is wanted is something more than this; it is an integration in the mind of the investigator of the main facts of the chief sciences which bear on agriculture.

An alternative to team work in agricultural investigation is to so widen and deepen the training and post-graduate experience that the individual can successfully attack problems now attempted by the team. At first sight, such a suggestion is liable to be ridiculed and set aside as utterly impracticable. Nevertheless I am convinced that it is the direction in which progress is most likely to be made. In putting these ideas into practice, however, we are at the outset confronted with a great difficulty. On the one hand, we have to train our future agricultural investigators in several sciences so that they can bring knowledge to bear on the problem in hand from several points of view. On the other hand, as knowledge accumulates there is so much to learn that men have to specialize in one branch of science in order to avoid too long a period of training. There are thus two opposing tendencies to be reconciled. Men who can integrate and who can apply several sciences to an art like agriculture are constantly needed for all kinds of applied work. To advance pure science the specialist is also essential. How far can these two different classes be trained together and at what point must they begin to follow different roads? This is a matter of organization of teaching in the Universities. It is one which needs the most careful thought and one which will have to be solved if we are to reap the full harvest from the application of science to industries. Up to the present, the application of science to agriculture, although successful in many instances, nevertheless has not always led to useful results. If only the training could be broadened and the right type of man with the ideal combination of knowledge and aptitude could be set to work on the problems of to-day, it ought to be possible to accomplish more in the next generation than has been achieved during the last hundred years. The problems have been defined and are before us awaiting solution. The scientific knowledge and the ability exist in the great republics of learning. In many cases the means for doing the work have been provided. What is needed is the happy union of all these factors—the trained investigator, the problem and the means.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.— ORGANISATION.—The obsolete character of the present organisation of the Agricultural Department on the research side is dealt with generally in the Presidential Address to the thirteenth meeting of the Indian Science Congress held at Bombay in January, 1926. The work in the districts is also in great need of organisation.

On the scientific side, the problems underlying agricultural development are now approached by way of the separate science specialists. The successful solution of such questions, however, involves a knowledge of rural and trade conditions. As far as possible, the organisation should be based on the nature of the problem rather than on the separate science. A much wider training in the University and post-graduate stages is needed so that the investigator can bring several sciences, and also practical experience, simultaneously to bear on the problem in hand.

On the extension side, using this term in the American sense, at least three independent departments, Agriculture, Co-operative Credit and Civil Veterinary, are now engaged in helping the cultivator to improve his condition. This fragmentation of effort is unnecessary. The work involved in (1) bringing improvements to the notice of the cultivator, (2) in co-operative credit and (3) in the protection of stock from disease, should be welded together into one group which should also include the study of rural economics.

These matters—research and extension work—should be dealt with by a single department, which might be designated the Department of Rural Development. It should be organised in four branches, as follows, of which the first two only deal with research:—

(a) *Crop production*, to include soils and their improvement, cultivation, crops, irrigation, disease, and so forth.

(b) *Animal husbandry*, the improvement and feeding of stock and the diseases to which they are liable.

(c) *Extension work*, bringing improvements to the notice of the cultivator; organisation of the seed supply, of improved implements and of credit facilities; rural studies similar to those recently carried out in the Punjab by Messrs. Calvert and Darling, marketing facilities, the protection of stock from disease and so forth.

(d) *Higher agricultural education.*—The organisation of the Department of Rural Development will naturally take some time. As opportunities occur, the various items, now carried on independently, should be grouped in the above-mentioned four divisions, and the new department will gradually take shape. It would at first work in close touch with all other departments connected with the uplift of rural India, such as those dealing with rural education, rural sanitation, irrigation, roads and railways, forests, and so forth. In future, it may be desirable to expand the new department and to absorb rural education and rural sanitation.

Administration.—The Department of Rural Development could either be supervised by Government directly or indirectly through an unofficial Development Board, the members of which should include representatives of the legislature, the executive, the scientific investigators, rural India, and of commerce. This matter is dealt with generally in the last chapter of my book on "*Crop Production in India.*" An actual example of successful administration on these lines is furnished by the Indian Central Cotton Committee. This is largely due to the great services rendered to the Committee by the merchant princes of Bombay. Uniformity in supervision is

not desirable at the beginning. One or two of the more virile Provinces might start with a Development Board; the rest would soon follow.

Finance.—The present methods of finance and of audit in research work in India are most unsatisfactory and should be terminated without delay. They are inelastic and lead to an enormous waste of money and energy. Further, there is no reserve from which to obtain money at short notice for purposes which cannot be foreseen when the annual budget is prepared. When savings could easily be made, the present rules lead to the waste of money in order to avoid trouble and to prevent reductions in future budgets. Research should be financed by Government indirectly by means of a Development Fund. Investigators, extension workers and teachers should be encouraged to pool their savings and to credit them into the Fund. A simple set of account rules, suitable for research, should be drawn up and the accounts should be examined by travelling auditors. The present paper audit now conducted by the Accountant-General should be discontinued.

The human factor.—Notwithstanding the enormous amount of expenditure on agricultural research and development work which has taken place during the last thirty years, the fact remains that India and the Empire possess at the moment very few investigators of outstanding merit. Such men have not been attracted and retained. They, however, exist in reasonable numbers in the great republics of learning—the Universities—but only very occasionally do they take up the work of agricultural research. The reasons for this should be carefully ascertained by the Royal Commission. No matter whether Indians or Europeans are to be engaged in such researches, the essential qualifications required are the same ability and aptitude. The essential act in the organisation of all forms of creative work is the selection of the individual whose business it is to do it. Numbers and forms of organisation can never replace quality in such matters and, at the most, are of only minor importance. A few highly-trained and well-qualified men are all that is required for the agricultural research work needed in India. The chief problem before the Commission is to show how to secure and retain the right men.

Questions 3.—Demonstration and Propaganda; 8.—Irrigation; 10.—Fertilisers; and 11.—Crops.—My views on the above subjects are to be found in my book, "*Crop Production in India*," Chapters III-V, and need not therefore be repeated here.

Question 4.—Administration.—Although it might have been practicable to have carried out all the agricultural research work needed in India at a comparatively small number of stations under the Central Government, it is not profitable, now that agriculture is a transferred subject, to consider this question in the abstract. The working conditions have been fixed by Parliament, and the various Provinces are now autonomous bodies. They all possess research institutes of their own (together with an independent cadre) and the power to make new appointments. Moreover, they show a distinct tendency to maintain a lynx-eyed vigil on their newly-won freedom. Any research proposals, therefore, which involve interference with the Provinces and with the Ministers will share the fate of those put forward by the recent Industrial Commission. The attempt then made to impose a set of Popes and Cardinals in scientific research was unanimously rejected by the majority of the workers in India, by scientific opinion in Great Britain, and also by the Indian Ministers. Two great advantages are likely to result from the transfer of agriculture to provincial control. On the research side, nine Provinces are now taking up the work independently, and therefore there is much more scope for new and original developments than if the subject were controlled by one authority. On the extension side, the chances of transforming what is now an official organisation into something indigenous which can take root in Indian village life are considerably increased.

An important field of work, nevertheless, remains to be extended and developed which it is very desirable that the Central Government should cultivate, namely, post-graduate training combined with the necessary research. This should be carried out at the Pusa Research Institute, at Bangalore and at Muktesar, on much more intensive lines than is now the case. To accomplish this, considerable re-organisation of these various institutes is essential. The superior staff must consist of men of standing, with considerable experience in research, together with a distinct flair for the post-graduate training of Indians. Such training will be their main work, and they will be expected to make Pusa, and the other places, real living centres for higher training, of which their future alumni will be proud. In this way, these institutes will insensibly acquire a much greater influence over the work in the Provinces than can ever be achieved by any system of organization. No trouble and expense should, therefore, be spared in recruiting the higher staff. Some attention should also be given to increasing the social amenities for young Indians at Pusa and in breaking down the barriers to free intercourse which now exist there. To establish effective liaison with the Legislature, to remove all fear of interference on the part of the Government of India with provincial autonomy and to help in obtaining suitable posts in various parts of India for the post-graduate students, the form and manner of administration of these institutes will need alteration. They should be endowed or financed by the Government of India as at present, but should be controlled directly by Boards of Governors on which the Legislature, the Government of India, the scientific workers and the Provinces are all represented. The Directors of each of these institutes should act as Secretary to the Board of Governors. In this way, the capital already invested in these various centres will not be lost. They will also be provided with a most useful field for future work. Higher training and post-graduate experience in agricultural research on crops and stock can, in this way, be provided in India itself, and the need for sending so many young Indians abroad will be removed. As many of the present workers at these centres were recruited for research under the Government of India, it will be necessary to secure their willing adherence to changes in their duties and in administration. Any who would prefer to resign should be allowed to leave and should be granted proportionate pension *plus* a reasonable compensation for disturbance, the sum to be fixed in each case by the Secretary of State.

Oral Evidence.

53,544. *The Chairman*: Mr. Howard, you are Director of the Institute of Plant Industry, Indore, and Agricultural Adviser to certain States in Central India?—Yes.

53,545. You have held various posts in India. Perhaps you will tell the Commission quite shortly what your Indian experience has been?—I was on the Pusa Staff from the beginning of 1905 to 1924. That is the only post I have held in India in addition to my present one.

53,546. We have before us your note of evidence, and also your book,* and various addresses and publications of yours are at our disposal. Is there anything you would like to say at this stage in addition to your note of evidence?—Nothing.

53,547. On the first page of your note of evidence you say, "The successful solution of problems underlying agricultural development involves a knowledge of rural and trade conditions. As far as possible, the organisation should be based on the nature of the problem rather than on the separate science." Is the organisation with which you are at present working (the Indian Central Cotton Committee) typical of the sort of organisation of which you are thinking?—No. I was referring to the official organisations which now exist in India.

* Crop Production in India.

53,548. Do you think it is necessary for the individual research worker engaged on particular problems to have a wide outlook, or do you think it is merely necessary for those who plan research to envisage the whole situation?—I believe that unless a research worker has this wide knowledge his results, although they may be true, will not lead to any practical advance, and will not accomplish anything more than the accumulation of data.

53,549. So that, to take a particular case, the heads of sections at Pusa should be men capable of taking a broad view of rural problems as a whole. Is that your opinion?—Yes, and more than that. They should not only be capable of taking a broad view of the rural problem, but also of trade conditions; and their scientific outlook should be much wider than that of the single science involved in the existing organisation.

53,550. You outline a scheme which would involve the grouping of the several departments at present engaged upon subjects that touch rural welfare, and you suggest that, directly or indirectly, such organisation after the grouping is completed might be supervised by Government directly or indirectly through an unofficial Development Board. You are familiar with the constitutional position in India to-day. How do you think a suggestion of that sort would be received by Ministers for Agriculture and by politicians generally?—I think it will be adopted by them in time, when they understand what is meant. My idea is this: these rural development questions are so large that (1) one will have to mobilise, as it were, all the directing power that a Province possesses, and (2) make the direction independent of politics and all other considerations—somewhat on the lines of our present Cotton Committee.

53,551. Are we to understand, then, that you suggest that the principle embodied in the Central Cotton Committee is one which might be applied to other crops?—No. I should expand that idea and apply it to rural development as a whole rather than to individual crops.

53,552. At present Governments, as such, are not responsible for the administration of the funds at the disposal of the Indian Central Cotton Committee?—Under the Act, the Government of India has certain supervisory powers; that is, the Viceroy in Council could intervene if necessary. If we brought forward new proposals they would have to go to the Government of India for formal sanction. The Government of India possess supervisory powers which, however, they have not used so far.

53,553. Do you think Provincial Governments would be content to see taken from them the complete powers which they possess at this moment over agricultural research, and to have those powers placed under the control of a semi-official body such as the Indian Central Cotton Committee?—Not as you put it; but supposing they nominated a large number of the members, and, instead of allowing these subjects to be dealt with by a number of independent bodies as at present, they had something like our Cotton Committee to deal with rural development as a whole.

53,554. You suggest, on page 185 of your note, that a few highly trained and well qualified men are all that are required for the agricultural research work in India. Are those men available in India to-day?—No. This is a matter for the future. A few already exist in the Empire. The policy of the future should be to employ a few well-paid and well-qualified men rather than entertain a large organisation. It need not necessarily cost any more. Probably the personnel would be no more than 25 per cent. of the present cadre, but they would be paid three or four times as much as the present investigators.

53,555. *Professor Gangulee*: Are you thinking that these men should be stationed at Pusa?—No.

53,556. Throughout India?—Yes. I am not referring to anything which now exists, but to something which might be established in the future.

53,557. *The Chairman*: I am not quite clear what you mean when you say on page 185: "On the research side, nine Provinces are now taking up the work independently, and therefore there is much more scope for new and original developments than if the subject were controlled by one authority. On the extension side, the chances of transforming what is now an official organisation into something indigenous which can take root in Indian village life are considerably increased." What do you mean by the last sentence?—I mean that if we are going to develop Indian agriculture and raise the rural conditions of India, we have got to bring the people of India into the undertaking, and we have got to change the present official aspect of our organisation and recruit everybody who can help forward the movement.

53,558. You say "the official aspect of the organisation." You do not suggest placing any part of the existing organisation under the village?—No. I do not mean that.

53,559. My difficulty is this. I should have imagined that, whether you decided to leave the control and administration of the existing organisations under the Provincial Governments or under some semi-official body, when you came down to the development of village amenities and life you would have to have new and entirely separate organisations?—I do not see why we should not deal with the development of rural India as one subject. At present we have agriculture; we have veterinary research, co-operation and so on as separate undertakings. I have in mind an organisation which would include all these various enterprises.

53,560. You say "an official organisation into something indigenous." Are you thinking of the propaganda organisation or the co-operative organisation, or of the whole lot?—Yes, everything.

53,561. *Professor Gangulee*: Let me get it clear. You suggest here that official organisations should be transformed into indigenous organisations. Is that your idea? You say here "the chances of transforming what is now an official organisation into something indigenous." That is, you are going to replace the official organisation with an indigenous organisation?—No, I do not mean that. What I mean is this. We have now a number of departments dealing with rural India in each Province. These departments are all independent; further, nine Provincial Governments are dealing with agriculture independently since the subject was transferred in 1920. Some bright individual may arise in one of these nine Provinces who might change the organisation and enlist every movement and every person, in that Province, to help in developing the country.

53,562. *The Chairman*: Have you anything you would like to tell the Commission as to the terms of service, pensions, and so forth, of the officers at Pusa? Do you consider those such as to attract the best type of worker?—I do not think the terms anywhere are sufficient to attract the men we really need. The problem of the agricultural development of the Empire is to get very much better men than we already possess.

53,563. Would you like to say, in detail, what you are thinking of in the way of improvements, so far as service or duty is concerned?—No.

53,564. As regards the management of Pusa, you suggest something in the nature of a semi-official body to manage it?—Yes, on which the Provinces are represented, on which the Government of India is represented, and trade, and so on—something which will bring the place, so to speak, more into the life of the country. It is rather in a corner at present, and it is a very minor item in the work of the Government of India. If a good Board of Governors was appointed, more interest would be taken in the institution.

53,565. How often do you think it would be necessary for a body of the sort you suggest to meet?—About twice a year, perhaps, to begin with.

53,566. And then afterwards they could meet once a year or as often as might be necessary?—Yes.

53,567. Would you leave the day-to-day management entirely in the hands of the Director?—Yes. Certain cases would, of course, have to go before the Board of Governors.

53,568. The appointment and dismissal of officers would lie with the Board of Management as a whole?—Yes.

53,569. Would you suggest some smaller body to arrange areas of research and so on— a Board of Studies?—No. I think, if we had good men, that question would not arise. I think the men themselves would settle that very quickly. I would not have too much organisation and research. In the agricultural development of India everything will follow if we can attract the right ability. We need not have a large number of men. So long as there is a Board of Governors to see that the money is properly spent, and to settle certain questions which the Director cannot very well settle, no further organisation is needed.

53,570. What relation do you think research at the central station, wherever it may be, should have to research being carried on by the provincial organisations?—The difficulty is this. The subject has been transferred, and I do not see how, without going back on the ideas underlying the Reforms, we can now centralise research under the Government of India. If these political changes had not taken place, the subject could be considered. It is difficult at the present time to do anything in these respects, because whatever is suggested might be taken by the Indian Members of the Council as an attempt to limit their present powers. If we put Indian opinion against research, we might do more harm than good.

53,571. I think we see the difficulty. What we want from you is the solution?—If I could answer that question I should be King of China.

53,572. *Professor Gangulee*: Apart from political difficulties to which you have referred, do you suggest that such central guidance in research matters would be necessary for the efficient carrying out of the work?—If you have good men in the Provinces for research no co-ordination or direction will be necessary. If you have second-rate men, no system of organisation can ever make them anything more than second-rate men. It is the men who have to do the work who matter, not the form of organisation. The difficulties in centralising research in India lie both in the subject and in politics.

53,573. *The Chairman*: How far is it possible to justify the need for central research on the ground that there are certain basic problems awaiting solution which are of general application and which, therefore, may properly be allocated to a central station?—I have had some experience of this matter, as I was on the Pusa staff for twenty years. My difficulty was always this. India is too large a unit. The time taken in travelling, in the study of the different local conditions, and so on, make it very difficult to take up any big question relating to the whole of India.

53,574. You could not get over the ground?—No. In certain subjects one can take up a matter relating to the country as a whole, but with regard to crops it is very difficult to do this.

53,575. Apart from geographical difficulties, does the subject itself admit of being broken up into component parts, some of which are appropriate to a central station?—No. I think if we could have a fresh deal, so to speak, and begin again, I would not have an Imperial Department at all. The present difficulties arise from having research work under the Provinces and also under the Government of India.

53,576. If that is your opinion, why do not you suggest that Pusa should be done away with?—Because lakhs of rupees have been put into the Institute, which could be developed into a training centre for the whole of India.

53,577. Setting aside the training centre, and assuming that Bihar and Orissa will some day be in a position to take over Pusa as a provincial station, would it not, in your view, be a good thing if some other central station were constructed to take the place of Pusa?—I should not go so far as that. There is, of course, a field for central research in India, provided no attempt is made to interfere with the Provinces, but the trouble has always been that central research has always involved a certain amount of direction which the Provinces do not like. If a central Institute could go on quietly with research, without holding so many meetings, and if it could take its stand on the work it does rather than on its official position, the objections to central stations in India would to a large extent disappear.

53,578. Do I understand you to think, then, that, provided the calibre of the men engaged at Pusa is sufficiently high, and provided the direction is sufficiently good, the nature of the problems to be tackled are such as to justify a central station?—Yes. If they went to work on those lines they would find plenty to do.

53,579. That is why I let you off lightly by suggesting that Bihar and Orissa should take over Pusa. I thought you would jump at the opportunity?—That matter was discussed some years ago when the abolition of Pusa was under consideration.

53,580. Assuming there is going to be a central research station at Pusa, and that research is also to be carried on, as no doubt it will be, at provincial stations, how far is there a real need for what is called co-ordination between the central station and the provincial research station?—If the word co-ordination could be removed from the dictionary it would be a good thing for scientific development. Co-ordination in scientific work is not required and it is not a good thing to attempt it. The best thing to do is to leave things to develop for themselves.

53,581. Again, assuming that your Board of Management has to come into being, it would be concerned with a central station or stations. Your Director, while generally responsible to the Board, would be responsible himself, entirely, for the direction of research. Would it be necessary, apart from the Board, to have some general Research Council for all India?—No, I do not think it would. We have had what is equivalent to that already in the discussions which take place at the Science Congress. The moment one began to define the functions of one of these Research Councils, difficulties would arise.

53,582. You are probably very familiar with the trend of organisation and research in this country and in the Crown Colonies and Dependencies at the moment. There, it appears to me, speaking very broadly, that the attempt is to find out what is going on, assess what gaps exist, and to try and fill in those gaps. Do you follow me?—Yes.

53,583. That is a common-sense way, is it not?—Yes, but what the research workers in India fear is this, that some body consisting partly of research workers would be set up, who would sit in Simla, and who would attempt the direction of research for the whole of India. Very soon this board would be useless for the reason that its members would have given up research work and would be, so to speak, back numbers. In a short time the board would be completely officialised and would have set views. No progress would be possible under such a body.

53,584. Setting aside the unattractive word "co-ordination," how far is it really possible in practice for two research stations (let us assume they existed each in a different Province) to be brought together for the purpose of team work and for dividing a group of cognate problems between themselves. How far is that possible or desirable?—I think that will come about of itself much more readily if there is no organisation.

53,585. You would depend upon the men entirely?—Yes. I think it all comes back to that; the men are everything, the organisation is nothing. If we have not got the right men no system or organisation will ever make them more than second-class men if they are second-class men to begin with. I do not think, from what I have seen of organisation (that is, in the way of directing work), that anything very much will ever come out of it. On the other hand, we do get very rapid progress when the men are competent.

53,586. *Professor Gangulee*: You propose that the team work should be evolved spontaneously?—Yes. They either co-operate or not just as they like, as the spirit moves them. The moment you try to make them co-operate, they probably will not co-operate.

53,587. *The Chairman*: I gathered from your remark just now, however, that you do look upon Pusa as the appropriate centre for post-graduate teaching?—Yes. I suggested that as a means of making use of the work that has been done there, and of the buildings, rather than abolishing the place. There is a great need for good post-graduate training in India.

53,588. You know that, very soon, there will arise the question of training and recruiting the personnel of the new superior Agricultural Provincial Services?—I have not seen the recent papers on that subject.

53,589. Would you suggest that the higher officers in those services shall all be trained at an all-India centre?—No. Personally, if I had a free hand in the matter, I should not necessarily recruit Indians for research work; I should recruit for this branch of the work the best men I could find.

53,590. But so far as training for these Services is concerned, would you train them at an all-India centre or at the Provincial centres?—At an all-India centre.

53,591. And therefore, you might have a very considerable body of men going to Pusa for training of one sort or another?—Yes.

53,592. How far is it sound, in your judgment, to associate teaching with research?—What do you mean by " teaching " in that case?

53,593. Post-graduate training?—Yes, I think post-graduate training and research can easily go together. The difficulty comes if the research officer is asked to give a long course of lectures and ordinary laboratory teaching.

53,594. He has not the time?—No. He has not got the energy. It is not so much a question of time as of energy.

53,595. Do you mean in any climate or at Pusa in particular?—In the climate of Great Britain. I once had to do teaching and research, but I did not posses the energy to go on with the task.

53,596. Where was that?—At the South Eastern Agricultural College at Wye, in Kent. That is why I left that Institution.

53,597. You could manage three or four lectures a week?—No. If a man is going to teach really well, he has to get his mind into a certain phase for the purpose, from which it is not easy to switch off into research.

53,598. To turn to a different subject, do you think it would be a good thing if the principle of the Central Cotton Committee were to be applied to other crops, and, if so, to what crops?—I have gone into this matter in some detail and have made some enquiries. I thought at one time it might be possible in jute, and I thought of making that suggestion in " Crop production in India." I finally came to the conclusion that we could not found in Calcutta for jute an organisation similar to the cotton committee in Bombay.

53,599. Why?—Because Calcutta and Bombay are different. I do not think we could get all the interests concerned with jute to work together.

53,600. They get enough jute to satisfy the market, and they are not

interested in larger crops? Is that it?—I am sorry to say I cannot answer that question. The information I obtained on this subject is confidential, and I must not tell you.

53,601. It is a fact that the crop satisfies the market, and that must have an important bearing on this particular question?—Yes.

53,602. *Sir Ganga Ram*: Your proposition is no doubt very ideal, but, tell me, is it practicable in the present circumstances of the country?—You mean to mobilise the ability of a Province to direct rural development?

53,603. Would you trust this Development Board entirely with the power of the purse?—Yes, if it could be created properly. I would not if it were not a real Board; I would not give them anything. You may not be able to get a good Board in every Province, but there are some Provinces in which it is possible.

53,604. *Sir Thomas Middleton*: First as to the question of Pusa, and the purposes for which Pusa might be used. Cannot you see an object for which Pusa might be usefully employed as a central institution?—Yes, if Pusa could refrain from interference with other people. The difficulty with Pusa has always been that the question of the use of the place and the question of direction have always been united in people's minds.

53,605. We will take one or two subjects. Does Pusa suit as a centre for mycological work and bacteriological work? How is it placed?—In the first place I would not have either of those branches; I should include them in larger groupings. For example, I should unite bacteriology with chemistry and mycology with work on crops.

53,606. We will come to that later on. Take your own subject—plant breeding. Is Pusa suited for plant breeding work? It cannot cover the whole country obviously, but it must cover a wide range of India?—As regards the number of crops it is possible to grow there, one can grow almost any crop at Pusa, but when it comes to testing varieties from an economic point of view it is very unsatisfactory, because it is on the banks of a sand-bearing river and the soil is very uneven. That is one of the difficulties I found in regard to wheat. I had to get all the field trials done in the United Provinces. I could eliminate obvious unsuitable varieties, but when it came to be a question of selecting particular kinds for seed-distribution I found great difficulties.

53,607. It is very inconvenient, but it is a thing one is quite familiar with, that varieties which are produced in one station must be tested elsewhere?—Yes, that is true, but before that matter arises there is the question of deciding which are the kinds which deserve trial. For this a certain area of uniform land is essential, otherwise environmental points come in, and it is very difficult to make the final selection for the field trials.

53,608. As a matter of fact, certain people are able to overcome that very great difficulty?—Yes, that is true. It is a difficulty nevertheless. Will you state what is in your mind?

53,609. Take your own case in breeding Pusa wheats. Do you think if you had selected some other part of India in the beginning of your work you would have been very much further ahead in 1924 than you actually were in Pusa?—Yes, undoubtedly. If I had been stationed in Cawnpore or the Punjab I could have done twice as much, probably three times as much work on wheat.

53,610. What was the retardation mainly due to?—It was due to the climate, which is not a very suitable one for wheat, as you know, and to the uneven soil.

53,611. The answers I expected to get were, first of all, that certain characteristics would have emerged in the Cawnpore district which did not emerge so readily, or which were not so readily visible, in the Pusa district, so that you were unable to make up your mind in the Pusa district so early

as you would have been able to do in the Cawnpore district?—No. It is something in the altogetherness of the subject. It is very difficult to put it into words.

53,612. I think I appreciate the position. We were told, when we were at Pusa, that Pusa was naturally suited for cattle farming. Is it a centre which is suited for work on animal nutrition in the all-India interest?—Yes. I think it would have been better if they had developed work on animals there. I think it is an excellent place for such work. I once suggested, when the reorganisation of the department was under discussion, that Pusa should be used for work on animals, but this was not adopted.

53,613. To go back for one moment to your own subject of plant breeding, at present they are working on *cajanus indicus* at Pusa?—Yes.

53,614. Is the district well suited for breeding that particular crop?—Yes, but the difficulty of improving this crop lies in the method of fertilisation of the flower.

53,615. Your general view is that plant breeding work at Pusa ought to be restricted because of the natural disabilities?—I would not go so far as that. Rice could be studied quite well there.

53,616. We were told that one of the great objections to Pusa was that they could not study rice there. I could not see the reason myself, but we were told that?—Pusa is quite suitable for the study of rice. If you look at the figures of acreage you will find that Bihar and Orissa is the Province which stands second in rice production in India and in percentage of rice grown to total crops. Rice is the most important crop of the locality in which Pusa is situated.

53,617. Now we pass to another point, on which you have strong opinions; that is the training which a man requires. What you really want to breed is a new type of scientist?—No. What I mean is this. At present most of the scientific ability of the country goes into business and into subjects like metallurgy, and so on. The administration of the Empire has not yet made agricultural research a profession, and until it is made a profession which will attract the best ability of the Universities my personal opinion is that we shall go on in the way in which we are now. There will be no striking advance until the Universities, the Government, public opinion, industry and everybody else realise the importance of developing the soil of our Empire.

53,618. I am aware of the fact that some of the best men go into oil, etc., but I should think, taking the Universities as they are at present, you get just as much talent, on the natural science side, as you do on the mineral and metallurgical side?—I recently discussed this matter with one of the Directors of a big combination, and he said, "We take this view in selecting our man. If a man of 40 is not earning £3,000 a year we have failed in our task in picking out the right man." That is why the direction of these things must be taken from Government. Otherwise we shall not be able to select the men we need and to pay them what they are worth.

53,619. One point you make in your Presidential address is that in the Universities, since we cut up our subject into artificial divisions which we label sciences, we do not get the all-round training in men that is necessary for agricultural work?—Yes, that is part of the point; the rest of the point is that the men must not look at the subject from too narrow a point of view.

53,620. But we have got to look at it from the two points of view: the training of the man, and the man's point of view?—Yes.

53,621. And until we train a man we cannot get him to take the correct point of view?—You will have to alter the training.

53,622. You will have to alter the training before you get an alteration in the point of view?—Yes.

53,623. I want to know how long it will take to train the superman of the type you have in mind. There is a big range of natural sciences; you also suggest economics and trade?—He will probably take up some of those things himself, after the University phase. He need not be trained in everything while at College, but you must produce men who can approach the subject of agricultural development and look at it from every point of view. For this a wide training in a University is the first condition.

53,624. I quite agree?—You have got to get a wide range of vision.

53,625. I want to get some idea of the time it will take. Are you familiar with the Scottish curriculum, for example, as compared with the Cambridge curriculum; one is wide and the other is narrow?—Which is which?

53,626. I should like you to say which is which?—I do not know anything about the Scottish Universities; I only know they exist; I have never been to any of them.

53,627. What I should like to get from you is some idea of the length of training?—About five or six years.

53,628. That is essential?—Yes.

53,629. You could not do it in less?—I do not think you could; a part of the training would be at an experimental station, which might be located in the future at the University.

53,630. When you come to the selection of the young graduate for work, would you be satisfied with his college diplomas and degrees, or must you have some evidence that he is capable of undertaking research; that is to say, must he have gone through a post-graduate course before you select him?—Provided the personnel of the University was satisfactory, I should go very largely on their judgment as well as on academic performance.

53,631. So that presumably the man you would select would go to the University at 19, he would leave the University at 25, when he would be ready for post-graduate training; so that he would not be ready until he was 27 or 28?—Probably he would get his post-graduate training during the five or six years of his stay at the University.

53,632. And he has some 13 years before him until he is 40 and is then to be worth £3,000 a year?—That is the minimum. If he were worth more, I should pay him more; I should have no limitations as regards reward if a man is worthy.

53,633. Since we are on a question of training, I should like to have your views as to the quality of the Indian students whom you have come across in connection with post-graduate work?—It is very difficult to answer that question at the moment, because so much progress in India is now being made in scientific training and so on; the quality of the men in India is improving.

53,634. Because the facilities for training are improving?—The facilities for teaching are improving. I have followed this in connection with the Science Congress since 1914. Any opinion I might give to-day might have to be modified by the time the Report of this Commission is in print because things are changing so rapidly in India and the students and staff are improving every year. I would however not base the selection of the men to develop India on Indianisation.

53,635. I am not discussing that now?—The Indian students are better than they were.

53,636. They are better than they were because the teaching is better. Going round India we have heard a number of complaints about the quality of the students and so on; that was because the teaching was poor; it was not the quality of the student but the quality of the teacher that was at fault?—Yes, but the teaching of science is improving; the Indian Universities are getting better every year.

53,637. Is the Indian Science Congress a body like our British Association?—Yes.

53,638. Has it a standing secretary and office?—We have two permanent secretaries, the President changes every year and the executive also changes; some members pass off every year and new men come on.

53,639. About what number of persons attend the meeting of the Congress?—About 1,200 to 1,500.

53,640. And, as in the case of the British Association, are many of them members of the general public or are they all directly interested in science teaching and research?—In places like Bombay and Calcutta a certain number of the public are interested, but for the most part the members are from the colleges, the universities, the experimental stations and so forth.

53,641. *Sir James Mackenna*: You know that the system of organisation which prevails in India varies through the Provinces: in some Provinces division is made by crops; that is what we call crop specialisation, and in other Provinces the Province is divided up into the charges of Deputy Directors?—Yes.

53,642. Which do you think is the better way?—I should say both were bad. The difficulty about organising research on the basis of the crop is that the man will just look at that particular crop and will not study the crop with reference to the rural economy. In this way he may miss the real problem altogether. I have just come across that point in cotton. Almost everybody who is working on cotton in the Provinces is trying to evolve by plant-breeding methods a new cotton with either a longer staple or a bigger yield. The real cotton problems in my opinion on the black soils are something quite different, but they have not been noticed by any of these men because they have been too intent on the cotton plant. This is one of the great dangers of limitation. One is so apt to miss the real problem. With regard to the system of putting a Deputy Director in a district and expecting him to do research in addition to his other work, I consider this an impossibility. If he is to study the country, the people and all the conditions, he will have no time for research. If he attempts both he will do both badly.

53,643. Then who is to do the work?—What work?

53,644. Of crop improvement?—I should make that a branch of research; I should divide agricultural research into two groups: crops and animals; that is the natural division so far as one can divide.

53,645. What is the difference between a crop researcher and a crop specialist?—I would not limit a man to one crop in the narrow sense of the term. The worst of these terms is that they involve a limited area into which the problems do not fit. I have been working on wheat; if I had rigorously followed the organisation of the Agricultural Department, I should never have seen an acre of my wheats grown by the cultivator in India. At the time I brought out these wheats the standard of work on the provincial farms was low. According to the organisation, I ought to have sent my wheats to these provincial farms for testing; I did, and they all reported they were no use, largely because they had not then brought the technique in testing varieties to the stage it has now reached. I therefore want to see plenty of latitude for research in India, because one never knows where the organisation is going to impede progress.

53,646. Then, what was the method by which you did get your wheats adopted?—I gave a lecture at an exhibition. A manager of the Court of Wards brought all his cultivators to the exhibition who tried these wheats. They spread all over that estate, and afterwards over the Province in which it was situated.

53,647. *The Chairman*: Is not the organisation of the Central Cotton Committee based on the crop as the appropriate area?—That was the idea at first; I got the Committee to alter its opinion on that question. For instance, when the Indore scheme was first discussed, some members of the Committee wanted me to give an undertaking that I would only work on cotton; I refused, because I considered cotton should be considered, not as an isolated crop, but with reference to the conditions under which it is grown.

53,648. Associate it with agriculture in rotation and so on?—Yes, rotations, rural economy and everything.

53,649. *Sir James Mackenna*: Is there any difficulty in the crop specialist fitting in his work in this way too; supposing you have a specialist working on rice, cannot he look at the thing from the same point of view as you did, as a plant breeder?—Yes, he could, but you must be very careful that your organisation permits him to do so.

53,650. Do you think it would be difficult in a Province?—Yes, there are difficulties, because the moment you begin to divide a subject up into compartments, one man may want to extend his boundaries, and then there is trouble.

53,651. Had you much experience of teaching at Pusa in the botanical section?—In what sense?

53,652. Post-graduate teaching?—Yes, I had a certain number of students, not as many as I have now; I have eight at present at Indore.

53,653. Of course, when you were at Pusa the standard of biological training at the Universities was not particularly developed, was it?—No, it was not developed as much as it is now; neither did we have the same class of man coming into science in those days. We are getting a very much better type of Indian coming in now.

53,654. You say that, as the result of all your experience?—Yes.

53,655. A better type is coming into science?—Yes, better men in every way, better educated; and then, of course, we select our men; people who come to Indore for post-graduate training have generally got an M.Sc. degree or something of that kind in the University.

53,656. *Professor Gangulee*: Could you tell the Commission the composition of the governing body of the Indore Institute of Plant Industry?—Yes; the President is the Agent of the Governor-General in Central India. We have three representatives of the Cotton Committee, three representatives of the States, and the Director of the Institute is the secretary of the Governing Body.

53,657. Is the entire internal administration chiefly entrusted to this body or have you a committee of management?—No, that is only a Board of Governors; there are many things that come up for discussion; they are settled by the Governors, and the Director carries out what is settled.

53,658. So that the general administration is entrusted solely in your hands?—Exactly.

53,659. From where is the finance of the institute derived?—The capital was given by the Cotton Committee; we get a lakh of rupees a year from the Cotton Committee; I get about Rs.30,000 from the States.

53,660. From the Central Agencies?—There are a lot of other States coming in now; two came in just as I left India and others are coming in. Some Rajputana States are coming in; one has come in already. Then we have the income from the land, the proceeds of the sales of produce go into revenue.

53,661. Anything from the Government of India?—Nothing.

53,662. You are chiefly concerned, I understand, with cotton problems?—Yes, cotton in the wide sense of cotton production: not in the plant-breeding sense.

53,663. Who frames your research schemes? Have you any *ad hoc* committees to go into the different aspects of cotton production?—Do you mean with regard to India generally, the whole of the work of the Cotton Committee or my own?

53,664. In your Institute, you say you attack the cotton problem in all its bearings?—Yes. Are you speaking about Indore or about cotton?

53,665. Indore. I have got from you your Governing Body and your finance; now I am coming to your actual work. I want to know how you frame your research scheme; how do you proceed in planning your researches on various problems arising out of cotton production?—I read everything I could on the subject of Indian cotton; I then drew up a programme which was submitted to the Cotton Committee. As new aspects arise I deal with them in my annual reports.

53,666. You submit the scheme to the Cotton Committee?—Yes.

53,667. And suggest that a certain Province, say, Madras, ought to go into this or that question relating to cotton production?—No, I say nothing about Madras; I only deal with my own Institute.

53,668. Who allocates the research work?—As regards the scheme of research for cotton for India as a whole, our research sub-committee does that. We have drawn up a scheme of cotton research for the whole of India, which has been printed.

53,669. What is the relationship of your central institution, that is, the Indore Institution, with the institutes supported by the Indian Central Cotton Committee?—They do not support any, except the Technological Institute in Bombay; the Committee give grants to the Provinces, but the only research institutes that they have are at Matunga and Indore.

53,670. You give grants to Cawnpore and Madras and some of the stations?—Yes.

53,671. How do you keep in touch with the work that is going on in these different sub-stations?—We have a very strong research sub-committee of the Cotton Committee, which deals with all questions of research and all questions of training.

53,672. So that your sub-committee is what we call a co-ordinating and directing agency?—No, we do not co-ordinate; we do not attempt such a thing.

53,673. How do you develop the team work between, say, the United Provinces sub-station and your central station?—We do not; we do not work that way. We do not attempt to coerce a Province or coerce a man. If a man comes forward to the Cotton Committee and wants a grant of, say, Rs.20,000 for some particular purpose, he puts forward his proposals, we consider them and we then grant or do not grant that money, according to the merits of the case. When we have given the money, say, for a period of five years, we let the investigation alone. We should look very carefully into the work at the end of five years; if it were a failure we should not give any more money; but while the investigation is in progress we let the investigator alone.

53,674. Let me get it quite clear from you. Take a specific problem like cotton wilt; with regard to that problem do you say: "Madras ought to do that work" or "Bombay ought to do that work"?—Supposing we did, supposing we said: "Bombay shall do that work" or "Madras shall do that work," in my opinion it would be a wrong way of looking at the question. As a matter of fact, we should not do such a thing. If they had a man at Bombay who could do such work, and if he came forward, we should ask him to undertake the task, but we should not ask a Province. If there is no man, we leave the Province alone.

53,675. Cotton wilt is a problem?—Yes.

53,676. How would you tackle this question from your institute?—How would I do it personally?

53,677. No, how would you allocate this work in your research scheme?—Yes, it is a problem in certain cases. We have got a man working on it as a matter of fact.

53,678. Where?—In the Central Provinces.

53,679. Working in any other sub-station?—No, he is a Government man. He asked for a grant because he wanted to work on cotton wilt, and we gave him a grant. It is one of those cases where money has been given to a Province, and we are waiting to see what they will do. They send in reports occasionally; once a year a man is expected to send in a report, more for information than anything else.

53,680. You are in touch with that work?—We are very much in touch with them, but not in the sense of interference; we do not interfere; we do not even suggest. If a worker in the Province cares to come to me, as they often do, and ask my opinion about a certain thing, that is done privately, but there are no papers about it.

53,681. Do you think there is a great scope for cotton improvement in India by hybridisation? Up till now I think the work has been confined to selection?—Yes, unquestionably there is; but I should say with regard to the cotton problem in India, the plant breeding side is not the side to deal with in the first instance. Plant breeding should come later, in my opinion. There are many other things which have to be put right before we can plant-breed with effect.

53,682. Is there any specific problem you have in view with regard to cotton production in India that you want to emphasise?—No, I think we can leave such matters to the Cotton Committee, which is now working out its own salvation in this respect.

53,683. *Sir Henry Lawrence*: In what period of time?—I should say that in another five years the Cotton Committee will have got its schemes very well forward, and we shall have results which will affect trade.

53,684. *Professor Gangulee*: On page 186 you say: "Some attention should also be given to increasing the social amenities for young Indians at Pusa and in breaking down the barriers to free intercourse which now exist there." What is the nature of those barriers?—The difficulty is this: it turns on what I consider is the wrong organisation; Pusa works too much in compartments. A club for Indians and Europeans was in existence at one period which was rather useful in bringing the men together from the various sections. It is now no longer in existence.

53,685. There is no organisation in Pusa to bring about free intercourse among workers?—No. Many Indians who came to Pusa for research work often brought their problems to me for suggestions; and out of this the mixed club partly arose.

53,686. You further suggest that the need for sending so many young Indians abroad will be removed. Do you think it is desirable to remove that necessity of sending our young men abroad?—There are a good many people in India, as you know, who cannot afford to send their sons abroad without great sacrifices.

53,687. You would not accept it as a principle?—I think a country ought to train its own people as far as it can. That does not mean that none should go abroad. I should improve the training facilities in India itself as far as possible.

53,688. To obtain a supply of your ideal investigators, do you not think it is necessary to send our young investigators abroad to get a wider outlook?—At the present moment my ideal investigators in rare cases only would be Indians. I should get the best men for research I could find. If the Indians came up to the standard, then I would recruit them, not otherwise. I should not place recruitment for research on a political basis.

53,689. I was not referring to immediate recruitment; you misunderstand me. I suggested that in order to get your ideal investigator it would be

necessary to send Indian workers out into the wider world to get experience?—It is difficult to answer that question, because it depends on the man; he may learn all he wants to know in India.

53,690. But, as a principle, do you think it is necessary for any investigator to come into contact with the scientific atmosphere abroad?—Yes, there is nothing to prevent him travelling in other parts of the world; but my point is that a lot of Indians are sent to Europe at the present time for training which could be given a better training in India. You must not read into what I have said something which is not there. I do not wish to exclude Indians from going abroad at all; but there are many who cannot afford it, and it is desirable that they should be trained in agricultural matters in India as far as is possible.

53,691. *Mr. Calvert*: In your Presidential Address you say: "It by no means follows that the new kinds require more from the soil, and that their cultivation will be followed by a loss of permanent fertility. The improvement is closely similar to that obtained by replacing an inefficient machine by one which is better designed to do the same work." I took that statement round India, and I found that the general opinion was that the new and increased outturn which they were obtaining as the result of the work being done, was actually resulting in taking more from the soil, and that more plant food would have to be replaced if agricultural improvement was not to come to a dead stop. To what extent does this question of applying more and more plant food limit the prospects of agriculture?—I should say it limits it more than anything else; it is one of the things that we are up against in cotton: increasing the amount of organic matter and improving the condition of the soil. I am paying more attention to these matters at the moment than to the breeding of new cottons.

53,692. In India, of course, we have special difficulties in this manure question?—Yes. If ever you come my way, I will show you (1) how we are working up all plants and plant residues into manure, and (2) the effect of this on the crop. We are applying, and successfully applying, Chinese methods to Indian agriculture. The Chinese discovered empirically one of the greatest principles of agriculture, namely, that the growth of a crop consists in two things: (*a*) the preparation of the materials for the crop which must be done outside the field, and (*b*) the growth of the crop. One of the weaknesses of Indian agriculture is the attempt to make the soil do both at once. The consequence is that we have a lot of conflicting operations going on in the soil at once and the yield is diminished.

53,693. The residue of the crop, do you mean?—The residues of all crops. China and Japan have been doing this successfully for centuries. In this respect a great improvement is possible in India. Did you get any experimental results on that question of improved varieties exhausting the soil? In cotton, for instance, it is only cotton fibre (cellulose) that is removed.

53,694. When your wheats yield more to the acre, does not that mean that you have to put back more plant food on that acre?—No, because in the Punjab, for example, and particularly on the Frontier, it is more than likely that the local varieties take more out of the soil than higher yielding varieties. The difference, however, is in the straw, not in the grain.

53,695. *Professor Gangulee*: Is not the root system of the plant of importance in this connection?—Yes, that is one thing. But if it is a fact that improved varieties do take more out of the soil, it is a question which could be very easily proved. We have, so far, had no definite figures or anything more than an idea that that is so, and certainly from the experience I have had I should say it does not hold good. In fact, it might be that an improved variety will take less out, because it ripens well within the growth period. Further, the amount of material that is removed by the crop is infinitesimal compared with what is already in the soil.

53,696. So that, really, your prospects for agricultural improvement are not necessarily limited by this difficult manure question?—No. I think the manure question and the general soil factors are the real problem before us in cotton; nothing else matters in comparison with that. Drainage is immensely important. We are losing thousands of tons of nitrates every year in India by de-nitrification because our surface drainage is not good enough. In fact, I should say one of the greatest openings for engineering ability in India is the scientific development of surface drainage. The whole of the Peninsula requires studying by the civil engineer from the point of view of drainage. What is being done in Italy should be begun in India.

53,697. *The Chairman*: In thinking over the crops that might possibly come under some such organisation as the Cotton Committee, did you include tobacco in your survey?—I have worked on tobacco, and have considered this question. The indigenous trade in tobacco is far more important than the export trade. In general the conditions in tobacco do not at all resemble those in cotton where Bombay is the main trading centre for cotton.

53,698. That is the place where you can tap the funds?—Yes, at Bombay we have the funds, the meeting ground, the trade and everything to do with cotton. In the case of tobacco, the internal trade is far more important than the export.

53,699. Do you take the view that tobacco may be a crop of increasing importance in India?—That depends on whether we can sell quality. We can produce high quality tobacco in India if we take sufficient trouble, but the question is: will the trade really pay the cultivator enough for quality? They pay a little. In the past the varieties grown and the trade are based on coarse high yielding varieties for internal use.

53,700. Can quality be grown sufficiently cheaply to compete in the quality market?—Yes, in certain areas: in Madras and in parts of Bengal.

53,701. So that you do think there is a possibility of extension?—Yes; it is a matter for the future. The quality problem arose after the cigarette companies began work; the cultivators complained that they were not paid enough for the trouble they took to get the extra quality.

53,702. If you could extend the quality crops sufficiently to justify and to finance the organisation, it might be worth while considering it?—It is one of the problems before us, but what will happen I should not like to say.

53,703. *Sir Ganga Ram*: Have you investigated the possibility of growing rye on inferior soils in India?—The European rye?

53,704. Yes?—Yes, I have grown it at Pusa.

53,705. On inferior or good soil?—On good soil.

53,706. Does it give an equally good yield as wheat?—I never took it to that stage.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Friday, the* 17*th June*, 1927.

Friday, June 17th, 1927.

LONDON.

Present:

The Marquess of Linlithgow, D.L. (*Chairman*).

Sir Henry Staveley Lawrence, K.C.S.I., I.C.S.	Mr. H. Calvert, C.I.E., I.C.S.
Sir Thomas Middleton, K.B.E., C.B.	Professor N. Gangulee.
Rai Bahadur Sir Ganga Ram, Kt., C.I.E., I.C.S.	Dr. L. K. Hyder.
Sir James MacKenna, Kt., C.I.E., I.C.S.	Mr. F. Noyce, C.S.I., C.B.E., I.C.S.

Mr. J. A. Madan, I.C.S.
Mr. F. W. H. Smith } *Joint Secretaries.*

Sir GILBERT WALKER, C.S.I., M.A., Sc.D., F.R.S., Professor of Meteorology, Imperial College of Science and Technology.

Replies to the Questionnaire.

Question 4.—Administration.—(*c*) (iv) During the years 1903 (June) to 1924 (June) of my service in India, I do not remember any request for information from those responsible for agriculture which was not provided by the meteorological department. Such requests were limited, as far as my memory serves, to questions regarding the climates of particular areas where special crops were under consideration.

Question 19.—Forests.—(*c*) The questions of the effect of forests on rainfall and of deforestation on soil erosion were very carefully examined by the Government of India in the Department of Revenue and Agriculture about the year 1906. Full reports were obtained from all the local governments as well as from the scientific departments concerned; and the conclusions were embodied in a final statement.

There was no satisfactory evidence that cutting down of forests had decreased rainfall, but it was clear that serious soil-erosion had resulted.

General Statement.

In reply to the wish of the Commission to have my views as to the assistance which meteorology in India can render agriculture, I would like to say at the outset that I have no specialist knowledge of agriculture, and that any remarks of mine can only be regarded as suggestions.

My instinct is that the study of a crop involves examination of its life history, and physiology; and, as a part of these, the physics of the soil. These may be studied directly, but a certain amount of light may presumably be thrown on them by knowledge of the effects of seasonal variations of rainfall, temperature and humidity. Such work as that of Mr. Hooker

on the English crops would perhaps be of value and could presumably be carried out fairly rapidly with the data in existence. A beginning was made by Mr. Jacob with rainfall, and I attempted to find the effect of other factors on other crops from time to time so as to stimulate the agricultural workers. One or two studies were sketched in my address at the Science Congress at Lahore and one or two others were embodied in notes on the files of the Department of Revenue and Agriculture at Simla. The data of crops then available were scarcely adequate for drawing reliable conclusions and my work had therefore no final value.

The question whether work on the relations between weather and crops should be conducted by the Meteorological or the Agricultural Department seems to me of fundamental importance; and to all such questions, I hold that there is but one reply. If materials of a subject A are required for study of a subject B it is the department of B which is responsible, as it is they alone who possess the knowledge requisite for the control of the work. The duty of the department of A is to provide all the materials required, and if necessary to discuss with department B the mode in which these data shall be obtained; but they are not to direct the policy, provide the funds or do the work.

To illustrate this principle, I would point out that weather data have importance on the opening and shutting of canal outlets, on the incidence of disease, and on financial operations, as well as on crops. But I do not consider it advisable that the Meteorological Department should take over work now carried on by the Departments of Public Works, of Sanitation and of Finance—the last in as far as budget operations depend on the past and the coming monsoons.

If I may be permitted a further remark regarding statistical methods, it would be that there is nothing very difficult in the ordinary processes employed; and mere knowledge of them no more qualifies a man for research on plant physiology than would knowledge of the rule of three. At Rothamsted, for example, an agricultural research station where serious statistical work is required, they have lately appointed to their staff a statistician with a view to his working as an agricultural specialist not as a mere mathematician.

Oral Evidence.

53,707. *The Chairman*: Sir Gilbert Walker, you are Professor Meteorology in the Imperial College of Science and Technology?—Yes.

53,708. You have been good enough to provide us with a note of the evidence that you wish to give; would you like to add anything to that at this stage?—I do not think so; I think my attitude is rather negative.

53,709. Your views are made very plain on the face of the statement. It has been suggested to the Commission that there is available, at Simla, a large mass of statistical and meteorological data which might be worked up and from which might emerge conclusions of much practical value if a sufficiently large staff were provided to do the work. Could you give us any views on that particular point?—My impression is that there is ample staff there for any task that is given the Meteorological Department to do in the way of legitimate co-operation; that is to say, that supposing you ask the Meteorological Department to undertake all kinds of inquiries into unknown regions, then it is impossible to say what staff would be needed for the purpose; but supposing you say to the Meteorological Department: "We want to know what was the rainfall in a particular district at a particular time," then, unless things have altered much since I was in India, there is ample staff.

Sir Gilbert Walker.

53,710. It is only when the principles governing the allocation of the work as between department and department are broached that further staff might be required; is that your view?—Absolutely; though, of course, I have no right to speak for my successors; I feel it is rather a difficult question for me to answer.

53,711. I am sure it is; you speak of the times when you were there?—I speak of the times when I was there. I had then a staff of something like twenty men occupied entirely in handling statistics, and when I wanted them to do any statistical work they did it and there was no difficulty about getting it done. We have improved methods lately in London and we can now do statistical processes in about a tenth of the time that it took when I was in India. If you are given series of values of two quantities and you want to work out the relationships between them and see whether one affects the other positively or negatively, the way you do it is to work out what is called a correlation coefficient. It took in India two clerks an hour to work out one coefficient; I now have an assistant in Kensington who does that in one minute with a machine. If conditions are as they were when I was in India, there is in my view ample staff for any mere provision of data.

53,712. *Mr. Calvert*: That is assuming you have the data and know what data you want to employ?—Yes.

53,713. But if you are asked when the next serious drought is likely to occur in India, you would not know where to search for the data?—That is another question; we have not the necessary knowledge; that is a question which could not be replied to anywhere in the world.

53,714. *The Chairman*: As to the value of long range forecasts, has your science reached a stage at which it is possible to forecast weather, sufficiently far ahead, with a degree of accuracy which will make it possible for the cultivator to adapt himself to what is to come?—Others here will be able to correct me if I am overstating the situation: my view is that if you ask us for forecasts every year, we cannot help the ordinary cultivator, but if you ask us to do what I think is the proper thing now, merely to express a guarded opinion of a general nature when conditions are very strongly marked in one direction or another, in other words, to issue warnings rather than regular forecasts, then I think we shall be right four times out of five, or say three times out of four, at any rate.

53,715. *Mr. Noyce*: What is the difference between a warning and a forecast?—I was thinking about daily forecasts; we issue a forecast every day as to what the day is likely to do, but we only warn people on abnormal occasions; my impression is that in half the years of serious drought we should issue a forecast which might be useful to anybody interested in rainfall over Provinces. I should not wish ordinary cultivators to use it until its reliability had been proved by experience.

53,716. *The Chairman*: Is that as regards long range forecasting?—Yes, I mean a forecast issued about the beginning of June for the monsoon period. Whether that is of any value to Government is a matter on which I have no opinion to offer. I think myself that at present we certainly should not be justified in expecting people to make use of the indications we give more than one year in six or eight. I do not think it would be fair to say that seasonal forecasting has as yet reached the stage at which we could expect Government to take much action upon it.

53,717. Is it, in your view, a hopeful direction for research?—Yes, undoubtedly. I have been working at the subject for years and I am working at it now; but my impression is that we have reaped a good deal of what will come from the methods hitherto employed; that is to say that the obvious thing to do is to ascertain how weather in India is affected by weather in other parts of the world during the previous six months or year. We have taken a number of stations scattered over the earth and

worked out the relationships of those with Indian weather. The consequences of those relationships have been ascertained and they have led to a definite amount of knowledge regarding the influences affecting the Indian monsoon. I do not suppose that during the next 10 years there will be anything revolutionary gained in that direction; I think the most hopeful direction in which to look is that of upper air conditions which, at present, are largely unknown; and little reliance can be based on inferences made from a period of less than twenty years. In other words, we have, as you know, an ocean of air extending to a great height; we know pretty well what has happened on the ground, but we know extraordinarily little about what has happened high up.

53,718. *Professor Gangulee*: Do you think measurements of the characters of the upper air are necessary for making reliable weather forecasts?—Yes, I do. One of the outstanding features of upper air which we found after two or three years is that, at the height of something like five miles, there are very strong westerly winds in the cold weather and comparatively feeble ones during the rest of the year. It was an obvious plan when looking for information to find out whether these upper strong winds were developing earlier and stronger than usual, and natural to expect that if they were, then winter conditions would be strongly marked and there would be good rains. I suggested that to Mr. Field and it turned out at once that there was a relationship of that kind. It has worked out hitherto in an amazingly successful fashion; I hope it will continue to work as well as it has done.

53,719. Do you think measurement of the characters of the upper air would involve the provision of more equipment than you have at the present time at Simla?—For that particular thing, no; but then that is merely the first thing we learned, and it seems to me we should be foolish if we did not look at half a dozen other things in expectation that we should get something from them; for example, the humidity up above. It is an obvious thing to measure from time to time how deep the monsoon is; and I believe that is not yet a matter of routine.

53,720. Is the information obtained by the Germans and the Dutch available to the Government of India?—Yes.

53,721. Is your Meteorological Department in touch with the various stations in the East?—Yes, to the extent that we get their publications; but the expedition of Germany to Central Africa was only that of one year.

53,722. Is the Jacob's method of working out correlation coefficients a sound one?—It can scarcely be called his method; like the rule of three it is a standard process which had been known long before he touched it.

53,723. Do you think he had sufficient agricultural data to work out the correlation coefficients that he did?—What he did was mainly to work out the extent to which rainfall affected the area under cultivation, as far as I remember; for that particular process I suppose the data were adequate.

53,724. You say that the data of crops, available at the present time, are scarcely adequate; what is your opinion as to the quality and type of agricultural statistics that we obtain now in India for correlating them with meteorological factors?—I am not competent to express an opinion; all I know is that, in the little bits of work I did from time to time in relation to jute and other crops, it was rather difficult to find what had been grown in a particular Province owing to ignorance of the shifting of products from one place to another. I got the impression that it was not very easily available, but, as I am not in the Agricultural Department, I feel I have no right whatever to express an opinion.

53,725. I am not really referring, now, to the inadequacy of data; I am asking your opinion as to the quality of data?—I have no opinion on that.

Sir Gilbert Walker.

53,726. *Sir Henry Lawrence*: Did your investigations touch the snowfall in the Himalayas?—Yes.

53,727. Do you think it will be possible, in the future, to forecast the period in which the snows will melt and what volume of water will come down the rivers in consequence?—That is a difficult question because it depends so largely on the amount of sunshine and the amount of cloud there is.

53,728. But the actual deposits of snow vary from year to year, do they not?—Yes; that is merely one, of course, of about half a dozen things that control the monsoon.

53,729. I am not thinking so much of the monsoon as of the floods down the rivers Indus, Ganges and so forth. Have you given any attention to forecasting, in any degree, the date on which the floods will come or the extent they will reach?—No.

53,730. Would that be a proper function of a Meteorological Department?—I think so, but it would be very difficult. You can form an impression, I think, in December of the amount of snow that is likely to fall in the forecasts that are made now, but we have not hitherto attempted, in the least, to form an opinion as to the date at which the floods will come down.

53,731. Of course, the maximum height to which those floods reach depends on the combination of rainfall with the melted snows?—Yes.

53,732. That is, it is affected by the subject of a meteorological forecast?—Yes.

53,733. All these rises of the rivers depend on the amount of melted snow?—Yes.

53,734. And that again depends on the deposit of snow in the previous season?—Quite.

53,735. Has any attempt yet been made to forecast the extent to which the melted snow will come down?—No.

53,736. Do you think it would be possible?—I should postpone it for another 25 years, certainly.

53,737. Then it is not a matter of practical politics?—I do not think so at all, now.

53,738. I was thinking at the moment particularly of the recent disastrous floods in the Missisipi and wondering whether your department could possibly foretell such floods?—I do not think so.

53,739. *Sir Thomas Middleton*: Were they foretold by the American meteorologists?—Not months ahead; of course they knew a week or two ahead. I got the impression when I was over there that when a given quantity of rain has fallen in a catchment area they know the extent. in feet upon the height of the river a distance further down, sometimes ten days or a fortnight ahead, when the distance is great, but only a few days if the distance is small. When I was in America one of the rivers was in flood, and they told the people some days ahead what might be expected.

53,740. How far ahead did they forecast the rainfall which caused the flood?—Not very far, perhaps 24 hours.

53,741. *Sir Henry Lawrence*: So far as similar floods of the Indus might occur, it might be possible for your department now to foretell it a week ahead; you would know that rain had fallen in the Punjab?—On that matter I hold very strongly that it is the work of the Irrigation Department or of the Public Works Department to work out the time intervals; I do not call such work meteorology. All the time I was in India questions of this type were arising.

53,742. Is there any arrangement between the Meteorological Department and the Irrigation Department on that point?—No.

53,743. Should there be?—Yes, certainly.

53,744. Can that be brought about?—I should say so.

53,745. By what means?—It is not for me to speak on administrative questions, but I should suggest an expression of opinion, an annual conference or something of that kind between the two departments concerned.

53,746. And some discussion between the head of the Meteorological Department, the head of the Irrigation Department and the Government of India?—Yes.

53,747. That anticipates that there should be a head of the Irrigation Department in the Government of India, but that is outside your scope?—I am doubtful. For instance, with regard to the Punjab rivers, the head of the Punjab Public Works Department could presumably depute one or two officers to meet one or two of ours and talk the thing over from time to time.

53,748. That of course is possible, but so far it has not been done?—Nothing whatever has been done. The Public Works Department were always friendly, but no conference was ever called. I definitely regard hydrology as the work of the Public Works Department; we know nothing about the depth of the rivers, the volume or any other details.

53,749. *Sir Ganga Ram*: I want to repeat to you the suggestion I put to Mr. Field in Simla, that a 24 hours' forecast is of no value to agriculture; he said he could give it three months ahead, provided this staff was given to him. Do you agree with that?—I should not have made that statement.

He said if the staff were given to him he could give a long range warning of something like three months.

The Chairman: I think it will be necessary to read in detail what Mr. Field said to appreciate precisely his evidence; you are not quoting his words, Sir Ganga Ram?

53,750. *Sir Ganga Ram*: No, I remember this was the answer, but I should like to refresh my memory again on that point. It is a very important point because, from the agriculturist's point of view, a 24 hours' forecast is no good to the zamindar?—I think we should have to wait many years before such a forecast could be made.

53,751. Was it not his meaning, in making that statement, to ask for a staff to be located in other places?—I have no right to interpret what Mr. Field meant.

53,752. *Sir Thomas Middleton*: I think the actual correlations which have been worked out in India in connection with agriculture are those between rainfall, area and outturn?—Yes, and also area under cultivation.

53,753. The area sown and the outturn?—Yes.

53,754. The first correlation with rainfall was the area sown and the second was the outturn I think?—I think so.

53,755. The question arises whether your rainfall observations are sufficiently numerous in any particular *tehsil* to enable a close correlation to be worked out. The original difficulty is that one doubts whether the data are there to make a close correlation?—If you had, say, 35 years for data, I think you could learn how the crops are affected by temperature and humidity and rainfall in a qualitative manner; personally I do not think you want more than that, but then I am not an agriculturist. I think you want to learn the controls of your crops; you do not want to say that on a certain date the price will be so and so.

53,756. I should like to get your opinion on a specific point. The crop in India on which we found most demands for forecasts was the jute crop; is there any way by which one could tackle the jute outturn from a meteorological point of view?—I made a little effort at that, and it certainly did not go very far; I got a correlation coefficient of something like ·5, which has no value for practical purposes. Whether anything

more could have been got with more data and greater skill and knowledge than I had, of course I do not know.

53,757. That is one specific crop for which, if we could establish definite forecasts based on good correlation data, it would be very valuable to the trade?—Yes, but there again that is an illustration of the uselessness of a weather department working at crops. I may, in my ignorance, start correlating the crop of jute with weather conditions when the crop is out of the ground; such an arrangement would be most unsatisfactory.

53,758. What would be necessary would be to establish some crop weather station in the jute area and to conduct operations for a period of about 30 years?—I think there is quite enough information on the meteorological side.

53,759. But I am thinking also of the growth of jute?—Yes, on the agricultural side; I know nothing about that; my instinct is that you would get a fair amount of data for 20 years, but I do not know how reliable it is regarding the jute.

53,760. *The Chairman*: I think perhaps I ought to read out the question which Sir Ganga Ram put to Mr. Field and his answer. Sir Ganga Ram asked: "Did I understand correctly what you said to the Chairman, that you will be able to say, in April, what kind of monsoon there is going to be?—Yes, I think so, later; it is a matter of many years. There is no question in my mind that we shall be able to do it in 50 years' time, and the degree of help that we are given by Government in the meantime will determine how much that 50 years' period can be shortened." —I do not object to that; I think that is fairly reasonable.

53,761. *Sir Ganga Ram*: Do you agree with that?—Yes, I think so.

53,762. *Mr. Noyce*: What work is Mr. Hooker doing on the English crops?—I do not know that he is doing any now.

53,763. I concluded from your note that there was some definite work of which you were able to give us particulars?—Yes, that is work which was done fifteen or twenty years ago.

53,764. What was its character?—That was the relations of the amount of various crops with the weather conditions of temperature and rainfall during previous seasons.

53,765. *Sir Thomas Middleton*: In the Eastern Counties?—I have forgotten that. He shows, for example, that the conditions of rainfall in the previous autumn were very important for wheat and for other crops; temperature was important at different periods.

Sir Thomas Middleton: The first paper was in 1907 and the second in 1922-23.

53,766. *Mr. Noyce*: What were the other factors, the effect of which you tried to work out? You mention, in your note, that you attempted to find the effect of other factors on other crops from time to time; what sort of factors were those?—Rainfall, temperature and humidity; those are published, I think, in the address* of which I sent in a copy. I do not know whether you agree with me in the general impression I was trying to give about the value of seasonal forecasts?

Mr. Noyce: I do.

53,767. *Mr. Calvert*: India has for about 25 years met with no serious widespread drought, and Sir Basil Blackett in his last Budget speech said that a bad monsoon was overdue. At the present stage of meteorological science, is there any prospect of even giving a warning of a bad monsoon?—

* Not printed.

Yes. But I do not think it is correct to say that during the past 25 years we have not had serious drought; the actual rainfall deficiency has been as great in two or three years as it ever has been since rainfall has been measured.

53,768. *Mr. Noyce*: 1919 was one of those years, was it not?—1918 or 1919, I am not sure which it was.

53,769. *Mr. Calvert*: There was nothing involving very large famine relief works?—I am quite certain there has been on at least two occasions during the past 25 years, as big and widespread drought as any of which definite records exist.

53,770. Is it possible, in the present stage of meteorological science, even to assist the Finance Member in his Budget?—No, for a reasonably reliable forecast cannot be made when the Budget is prepared.

53,771. *Sir Thomas Middleton*: Have you any evidence of the existence of cycles in Indian meteorology?—Yes, I think we have a great deal of evidence that there is nothing of value in them at all.

53,772. *The Chairman*: How far does history support the notion that a good Nile means a bad monsoon and vice versa?—It is completely false; the correlation between a good Nile and a good monsoon is about ·5 and is positive. We could make quite a fair forecast of the Nile, and the conditions which produce a good Nile are very nearly the same as those which produce good rain in North-West India.

53,773. It is not a question of the Nile getting what would go to India if the Nile did not get it?—No. The Nile floods come from the Atlantic Ocean; the humid currents cross in a north-easterly direction into Abyssinia; it is not the monsoon of the Indian Ocean that provides the Nile floods. That is an interesting phenomenon, as showing the world-wide character of the controls.

53,774. I was taking an even broader view; I thought the Atlantic provided, in some degree at any rate, the monsoon moisture?—I do not think it does.

(*The witness withdrew.*)

Mr. H. A. F. LINDSAY, C.I.E., C.B.E., I.C.S., Indian Trade Commissioner, London.

NOTE OF EVIDENCE.

The duties* of a Trade Commissioner are twofold. He acts, firstly, as a link between the Government he represents and business men; and secondly as a link between markets. His objective in these relationships is to stimulate the demand for the products of the country he represents. As Indian Trade Commissioner in London I am concerned with the markets for Indian goods in Europe and America, and my chief function is to introduce exporters in India to importers requiring goods such as India produces. As trade passes normally without the intervention of the Trade Commissioner, I find myself most frequently asked to assist in abnormal situations—for example, by the importer here who cannot get from India exactly what he requires or by the Indian exporter who has difficulty in selling his goods. In this way the natural course of my duties brings me (as a doctor is brought) into close contact with symptoms of commercial ill-health. The disease may vary from mere ignorance of the right market or of trade practice to the more extreme cases in which markets or prices are missed because the commodity produced is not exactly the commodity in demand.

As a result of four years' experience as Indian Trade Commissioner, certain definite conclusions have forced themselves on my notice, which may

*A detailed account of the work of the Indian Trade Commissioner will be found in his report for 1924-5 and 1925-6.

be of interest to the Royal Commission on Agriculture on the marketing aspects of their enquiry:—

(*a*) European and American markets in general are more critical of the quality and condition of the goods they buy, than they were before the war.

(*b*) This is due partly to keener competition and the necessity of eliminating waste and reducing raw material costs and partly also to higher costs of labour and the necessity of obviating unnecessary trouble and expense in manufacture.

(*c*) In general, Indian goods conform to these altered conditions, but in some instances they do not.

(*d*) The particular instances I have in mind, and on which I am prepared to give evidence if required, are:—

Cotton.	Tobacco.	Rice
Jute.	Groundnuts.	Beans.
Hemp.	Hides and Skins.	Oilcake.
Kapok (Tree Cotton).	Lac.	

(*e*) In regard to some of these, for example, jute, the difficulties experienced in foreign markets are very slight. In regard to others, as for example, cotton, great progress has already been made. Yet others, for example, hemp, would benefit considerably by the introduction of improved methods of cultivation and preparation in India.

(*f*) The subject is important, for every producer must in his own interests study the demands for which he caters. The prices which India obtains for her exports, and thus the foreign credits against which she secures her imports, could be increased if greater care were exercised in the preparation of certain exports for foreign markets.

The main factor in the situation, as viewed from European markets, appears to be the overwhelming need for still wider and better organisation of India's agricultural resources. It is true that immense progress has already been made, thanks chiefly to the efforts of India's agricultural experts and the response evoked from zamindars and cultivators alike. Further efforts are called for, not merely in research, but also (and perhaps more particularly, from the commercial point of view) in demonstration. The kind of organization required is one which will fit in with existing market conditions and will make its influence felt on every link of the long chain which connects the primary producer with the ultimate consumer.

As a member both of the Imperial Economic Committee and of the Empire Marketing Board, I have taken part in investigations of the United Kingdom markets for meat, fruit, dairy produce and oilseeds and have assisted in schemes of publicity which help to make Empire produce better known in the United Kingdom. What emerges particularly from these enquiries is the fact that the vendor who secures top prices is invariably he who knows and can meet the exact requirements of the consumer. If we compare the position of the Indian exporter with that of the overseas importer, we find that the latter is in a strong position. He can insist on contracts which stipulate for exactly what he requires and which penalise failure to comply. In some trades, claims for failure to attain a given standard are the rule rather than the exception. The Indian exporter is forced to quote a price which covers this risk, and in his turn to pay to the local or upcountry dealer a price which leaves himself a sufficient margin to meet any subsequent claims. India thus loses twice over—first in missing the premium on good quality and secondly in paying a premium by way of insurance against

possible claims. From this brief summary the following conclusions suggest themselves.

I. The need for an organisation in India which can negotiate on level terms with the overseas importer.

II. It must also exercise a direct influence for the improvement of up-country methods of production and preparation for market.

III. It must fit in with existing market conditions in India.

IV. It should preferably be an organisation by commodities or by closely allied groups of commodities; that is to say, by groups similarly produced and liable to export under similar contracts.

I do not wish to give the impression that India's difficulties in the markets of Europe and America are unique. Dominion producers and shippers find themselves similarly handicapped—indeed their difficulties are even greater because the goods they handle are chiefly perishables. The Dominion solutions of their difficulties are many and varied. Canada has formed its wheat pools, New Zealand its Control Boards, Australia its Producers' Organisations. These may all be described roughly as attempts to ensure uniformity of grading and economy of handling in the home country and, in some cases, by means of agents abroad to reach out as far as possible toward the oversea consumer, obviating unnecessary transfers of ownership. Those organisations are most successful which are most careful to set their own house in order and to provide for good quality, condition and packing before pushing into foreign markets. I understand for example that the Irish State has introduced stringent regulations penalising careless grading in their egg trade with the United Kingdom and that their agents here watch all consignments and report any infringements that come to their notice.

I do not quote Dominion example as one which India should necessarily follow. The need for organisation is the same in both cases, but the types of organisation will not necessarily be identical. As a matter of fact, India has developed her own type in the Indian Central Cotton Committee which has already done so much to improve the quality and reputation of Indian cotton. In the attached note dated 16th March, 1926, I have sketched the outlines of a scheme, which includes suggestions for raising the necessary finance.

MEMORANDUM BY MR. H. A. F. LINDSAY, C.I.E., I.C.S. (INDIAN TRADE COMMISSIONER).

The communiqué which was published by the India Office on the 20th January, 1926, summarises the terms of reference on which the Royal Commission on Agriculture in India will be asked to report. They cover a very wide field. I have come into close contact with agricultural work for some years past in India, both at meetings of the Board of Agriculture, and also from the commercial point of view when I was in charge of the Commercial Intelligence Department at Calcutta. I have also studied the whole question from a somewhat different angle, namely, that of the London market. The following suggestions are offered as a result of experience gained chiefly on the commercial side. It is important that this side of Indian agricultural problems should not be lost sight of.

The inquiry seems to fall naturally into four closely defined stages:—

(*a*) Research.
(*b*) Demonstration.
(*c*) Marketing.
(*d*) Finance.

To take these in order:—

(*a*) *Research.*—This term covers a very wide field. There is not only the question of plant breeding and the selection of the fittest type; but also the investigation of soils, the use of manures and the reform of agricultural methods generally, from sowing to harvesting. A good deal has already been done, particularly in regard to the best-known crops, such as cotton, jute, sugarcane, rice, wheat, and other staple commodities. But there can, of course, never be an end to research. Not only must every possible avenue of improvement be tried out, with a preference to those which offer the best chance of success, but also there must be the machinery to deal with new problems as they arise.

In this connection, I should like to draw attention to the attached statement (Appendix I*), which compares the relative areas under different crops in India in 1903-04, 1913-14 and 1923-24. It will be seen that out of 249 million acres cultivated in 1923-24, 197 million were under food-grains and 14 million under oil-seeds. This leaves a balance of only 32 million under cotton, jute, sugarcane, tea, tobacco and other crops. A good deal has yet to be done for the inferior food-grains, such as pulses, millets, &c., which account for 95½ million acres out of the total cultivated area.

(*b*) *Demonstration.*—This raises an important problem which will face the new Commission. Research can be carried to a considerable degree of proficiency in proportion to the staff and funds available. The difficulty is to ensure the application of the results by the Indian cultivator. Here is, of course, the weakest and at the same time most vital spot in the whole agricultural system. To perfect research but not to apply it is like maintaining a perfect engine in perfect running order, but omitting the driving band which connects it with the machine. And, after all, the machine and its output is the main object in view, to which the engine is, or should be, purely subservient. Demonstration and agricultural education generally have been the subject of special inquiries from time to time, e.g., a special Committee on Agricultural Education which sat some years ago at Simla; see also discussions at the Board of Agriculture meetings of 1916, 1917 and 1919.

(*c*) *Marketing.*—This raises two important questions; firstly that of bulk storage for the prevention of waste, and secondly the prevention of adulteration and mixing. The former question was discussed at the Board of Agriculture meeting of 1919. I should like to add that Mr. A. V. Alexander, M.P., who gave evidence recently on behalf of the Co-operative Wholesale Society, before the Imperial Economic Committee, suggested bulk storage of wheat in India to prevent waste. I understand that the Railway Department in India has this question under consideration. Adulteration is a subject which the Government of India have taken up from time to time. The India Office have copies of a circular from the Department of Commerce and Industries to all Departments of Commerce, No. 9164, dated 8th August, 1917, and connected correspondence; please see the official letter from Mr. Ley to the Revenues and Statistics Department of the India Office, No. 13905, dated 7th December, 1917. This is a very important matter, and will want careful investigation.

(*d*) *Finance.*—Another important problem which will face the Royal Commission will be that of making available the capital necessary for the introduction of improved agricultural methods. To a certain extent capital is available, but it is timid. With centuries of experience behind him, the cultivator has carried to the highest possible degree the art of making the most of the small capital at his disposal. He is very largely in the hands of the moneylender, and social and domestic drains on his slender resources leave him very little for the adoption of improved methods. He is a shrewd judge of what is fundamentally in his own interests, and at the present stage of education in India is much quicker at picking up new ideas than he would have been 20 years ago. I have little doubt that if the funds can be made

* See page 805.

forthcoming, the best practical method of placing them at the disposal of the individual cultivator will be by means of Co-operative Societies and Rural Banks.

The above is merely a brief survey of the main lines of investigation which the Royal Commission will doubtless pursue. From one's experience of the commercial point of view, one realises how seriously India is handicapped, both in internal and external markets, by defective methods of preparing crops for the market and in marketing science generally. India has enormous resources and could do a great deal more with them than she does at present. What she requires is chiefly organisation and finance.

Let me take the financial side first. My chief point in preparing this note is to indicate how funds can be found, adequate to the objects in view. The recommendations contained in this note have already been accepted by the Government of India in principle. In fact, what I suggest is really further progress on lines already in part approved and applied by Government.

My suggestion briefly is that a small export duty or cess should be imposed on agricultural produce exported from India. These exports amount in the aggregate to very large quantities, and it would require only a small export cess to command a considerable annual revenue. This revenue, I suggest, should not be included in the official revenues of the Government of India. It should be collected by Government agency through Collectors of Customs at the ports, and after collection should be organised as a fund for the improvement of India's agriculture. That is to say, the funds required would come from the industry and would be returned to the industry.

Let me give first one or two instances in which this method has already been applied with success. On application from the Indian Tea Association, the Government of India passed in 1903 an Act which provided for the collection by Customs authorities of a small export duty on Indian tea. The proceeds of this duty are handed over to the Indian Tea Association and provide them with funds for research, and for the maintenance of their organisation generally. Only so recently as 1923, the Indian Cotton Cess Act was passed, providing for the collection of a cess of 4 annas a bale on all cotton produced in India and either exported or consumed in an Indian mill. The proceeds of this cess are handed over to the Indian Central Cotton Committee for research work and also for the organisation of the cotton industry generally. I could quote similar instances from the indigo and lac industries.

As tea and cotton are already provided for, there would be no need to include them in the new scheme. Jute is in a peculiar position, for it already pays an export duty, the proceeds of which are absorbed in Government revenues. But funds are necessary for further research and demonstration in jute cultivation, and particularly in regard to the distribution of improved types of seed; this question became urgent only last year, when the Dundee and London Association promised funds to further official research. It seems only reasonable that some definite proportion of the revenue drawn by Government from the export of raw and manufactured jute should be handed back to the industry. Indigo research was at one time financed in the same way, but I understand that the export cess is no longer collected; it would be for the industry to decide whether it was a success and should be re-imposed. Coffee, I understand, provides its own funds by collections from the planters, which are applied for research purposes. It would probably simplify matters if an export cess were imposed in place of the voluntary levy, and the proceeds handed back to the industry.

Rice at present pays a small export duty. This industry is in rather a peculiar position, as India supplements from Burma any shortage in her own requirements, and exports are chiefly made from Burma. It does not seem unreasonable that the cess at present imposed should be refunded for research purposes in India and Burma, even although this means that the province

which finds the money will only benefit partly by the proceeds. On the other hand, Burma at present benefits by the investigations of the Indian Central Cotton Committee, financed by exports from India and levies from Indian mills.

I have attached as Appendix 2* to this note a schedule which summarises the different classes of agricultural produce exported from India; the average prices obtained on export from the ports pre-war and during the last three years for which statistics are available; the amount of cess suggested in each case; and the total yield. It will be seen that this proposal would yield a revenue of no less than Rs.1,63,00,000 per annum. In no case would the cess press at all hardly on the industry concerned.

Next with regard to organisation. It will be necessary to evolve some organisation which would control the spending of this annual revenue. It would examine very carefully schemes of research and demonstration, and would also, so far as possible, finance Rural Banks and Co-operative Societies generally which arrange for advances to individual cultivators for the use of improved seed, manures and improved implements and agricultural methods generally. The best way of proceeding would appear to be to create some form of Agricultural Development Commission which would be central for the whole of India and would work through local committees. The Central Commission would be organised on much the same lines as the Indian Central Cotton Committee is at present, i.e., it would contain representatives of provincial agricultural departments; of local agricultural interests, of local trade interests and of Indian States. The local committees would represent local agricultural and trade interests under the control of the local Departments of Agriculture.

There is one further point. There are many complaints, both from internal markets in India and also from external markets, as to the condition in which Indian agricultural produce is marketed, with special reference to adulteration and mixing. It is only those industries which are well organised at present that are able to effect the necessary improvements.

Tea is the outstanding example, and cotton will undoubtedly improve under the direction of the Indian Central Cotton Committee. A good deal of progress has been made in regard to wheat, where the London importers have been able to insist on an absolutely pure basis, which puts a premium on clean wheat. Complaints have recently been made in regard to Indian hemp, and there are many instances of adulteration in regard to oil-seeds, oil-cake, &c.

Hitherto, Government has told the trade that they must set their own house in order, and the trade have replied asking Government to legislate. Where Government can help the trade is by helping it to organise itself. It was only when a strong Wheat Trade Association was formed in Karachi that the London Association was able to negotiate a contract which gave Indian wheat a cleaner basis and better terms in the London market. The local committees proposed in terms of this scheme will be able to do much by direct negotiations with London and other trade associations with a view to cleaner marketing and higher prices.

Oral Evidence.

53,775. *The Chairman*: Mr. Lindsay, you are Indian Trade Commissioner in London, and I think you have also seen service in India?—Yes.

53,776. What was the nature of that service in India?—I went out in 1905, and after a certain amount of district work I joined the Commerce Department of the Government of India as Under-Secretary in 1912. I

* See page 806.

have remained in the Commerce Department ever since as Director-General of Commercial Intelligence, Calcutta, and also at the headquarters of the Commerce Department.

53,777. We have your note of evidence; would you like to make any statement in addition to that at this stage?—I do not think so, except the general statement that I am, naturallly, particularly interested on the commercial side.

53,778. You are concerned with exports from India to Europe and America?—That is right.

53,779. Who is concerned with the import into India of goods from overseas?—The overseas authorities representing the countries from which the goods come; the principle is that every Trade Commissioner pushes his own exports.

53,780. From the Indian point of view, what exactly is the function of the Director-General of Commercial Intelligence and Statistics?—His function is practically the same as mine; he is looking after the overseas markets for Indian goods.

53,781. He looks after the Indian aspect of the export trade and you look after the European and American?—Yes, and he also looks after other markets, such as the Far East, Africa and Australia; I do not touch those.

53,782. Neither of you is concerned directly with the reciprocal trade into India?—No, we are not concerned with that.

53,783. Is anybody directly concerned with that, other than the persons interested in promoting trade, either as officials or non-officials, in the various countries exporting to India?—Of course, the various countries exporting to India in many cases have their own representatives in India, and they are the people who look after the exports from their respective countries; America, Canada, as well as Great Britain have their own representatives in India.

53,784. What correspondents or representatives have you in European countries other than Great Britain, and in America?—I am a member of each of the British Chambers of Commerce at Antwerp, Paris, Milan, and I am in close touch with those in Hamburg and Lyons.

53,785. *Mr. Noyce*: Marseilles?—There is not a British Chamber at Marseilles; but, in addition to that, of course, His Majesty's Consuls-General everywhere on the Continent are prepared to give me information. The usual lines would be that an ordinary enquiry as to the standing of a Continental firm I should address to the British Chamber of Commerce; but if a particular report were called for on some line of trade for which I wanted to know the opening for Indian goods, I should in the ordinary course go to the commercial attaché or other British Consular officer, through the Department of Overseas Trade.

53,786. *The Chairman*: Do you find it possible for you, sitting in London, adequately to discharge your functions so far as they are concerned with the Continent of Europe?—No, the arrangement is most inadequate; I suppose I do a hundredth part of the work that I ought to be doing on the Continent. I have participated in various fairs and exhibitions on the Continent as widely as possible, but on a fairly small scale in each case, and I find from that that Indian goods are not as well known on the Continent as they ought to be, and it would not take very much pushing to make them better known.

53,787. At least, London is the commercial centre for much of the trade between India and the Continent, but in the case of America I take it it is more difficult for you to discover exactly what might be done and is being done?—Yes, that is quite true; my relations with America are even slighter than with the Continent.

53,788. Do you think the volume of trade between India and Europe and between India and America, and the possibilities of expansion in both cases,

would justify the Indian Government in incurring heavier expenditure on employing a larger staff in this work?—Yes, I certainly think so.

53,789. Do you think the return to merchants in India would be commensurable with the expenditure?—I have absolutely no doubt whatever on that score. One gets repeated evidence that Indian goods are not known there as they ought to be.

53,790. Have you made recommendations to the Government of India through the High Commissioner to that effect?—I was asked for my opinion when I was Director-General of Commercial Intelligence in 1919; I was asked to put up full proposals with a list, in order of precedence, of the countries it seemed most advantageous to appoint Trade Commissioners in. But immediately after that came the retrenchment axe, and the result was that, far from any advance being made, my own staff was cut down. I had that scheme worked out, and I think it was approved by the Government of India prior to the retrenchment.

53,791. Do you correspond, in any matters, direct with the Government of India in India, or is all your work done through the High Commissioner?—I correspond direct with the Commerce Department of the Government of India every week, and the High Commissioner of course either sees those letters or they are letters which I have discussed with him before I have written them.

53,792. But, technically, the High Commissioner is responsible for the things which you do?—Yes.

53,793. What is that scheme which you put up and which suffered death by the axe? What did it amount to in terms of men and money, roughly speaking?—I did not get down to details of the pay suggested or the staff suggested in each headquarters; I merely showed that the results would be beneficial to Indian trade; I also made my recommendation of the particular markets, in order of precedence, where it would pay most to establish men.

53,794. Under existing conditions, do you make use of the British Consular personnel?—Yes, I do, either directly or through the Department of Overseas Trade. Mostly, I do it through the Department of Overseas Trade.

53,795. To come down, in greater detail, to your organisation in London, is that adequate, so far as your work in London and in Great Britain is concerned?—I cannot say it is; it was very much retrenched as the result of the Inchcape Committee's recommendations. The staff, when I took over charge in February, 1923, was, if I remember right, three assistants and 12 clerks. It now consists of one assistant, a head clerk, two male clerks, one woman clerk and a shorthand typist.

53,796. Do you concern yourself, at all, with the financing of Indian exports? Are you in touch, at all, with the City in the matter of financing the export trade?—Questions of finance do not come my way; if I were asked, I should certainly do anything that I could to help.

53,797. You are, in the main, in touch with the merchants?—Yes, and of course they do their own financing.

53,798. What I was concerned to discover was this: how far is it necessary for you to be provided with a subordinate in close touch with business houses and financing houses in the City of London?—I think that is a side which is really beyond the Trade Commissioner's purview, the financial side.

53,799. On the merchant side, are you properly equipped, so far as personnel goes, for that work? Are you yourself, broadly speaking, familiar with the merchants interested in Indian goods?—Yes, I am personally familiar with the merchants and with their work. The difficulty that I find is chiefly this, that it is very difficult to deal with the technical side of all enquiries. The direction in which my staff really requires strengthening is on the technical and expert side; the three assistants that I mentioned, whom I had when I took over charge first were, first of all, a

Geological Survey officer who knew the London market for minerals well, the second man was a Customs assistant who knew the Indian Customs routine well and could answer all Customs enquiries, and the third was an Indian assistant who assisted me in the general conduct of the work. That Indian assistant is with me now as Trade Publicity Officer and he is my only assistant. The direction in which I think the staff might usefully be strengthened would be in having, again, an officer of the Geological Survey from India, and, if possible, an Agricultural Service officer; those two would be the absolute minimum.

53,800. Are you helped by merchants in this country to discover criticisms and faults in Indian produce exported to this country, so that you may convey the information to the Government of India?—Yes, I receive a good many complaints in regard to the quality of Indian produce marketed here.

53,801. It is not always possible to rely upon the self-interest of the merchant in a matter of that sort; he may be prepared to make his turnover on inferior Indian goods?—Most distinctly.

53,802. Is that a phase which is always before your mind?—Yes, it is always there. Also one finds that the complaints increase rather as the market goes up; naturally, with any shortage there is an effort to expand the existing crop, and the complaints tend to increase.

53,803. The merchant is concerned with the volume of his turnover and the margin of profit which he makes; he is not concerned with the excellence of the goods or the price which the grower or the Indian merchant receives?—Yes; that is to say, he wants to increase the volume of the turnover and takes his risk of claims.

53,804. Are you advised by any group of merchants or advisory committee of persons interested in Indian produce?—No, I have no recognised advisory committee, but when any particular question turns up I know at once whom to ask for assistance.

53,805. Have you ever considered the advisability of forming such an advisory committee?—I remember the question was put to me when I was Director-General of Commercial Intelligence in Calcutta, whether it would not help me to have an advisory committee. I went into the thing very thoroughly there, under conditions which correspond roughly to the conditions in which I am working here in London. On the whole, I thought it was wisest not to ask for the appointment of an advisory council.

53,806. Do you still think that?—I still think that. There were several reasons. The first was that the questions that turn up in regard to even one line of trade are singularly different and I cannot tie myself down to the advice of any one expert or any one merchant on any particular line of trade.

53,807. How far has it been possible to carry through a detailed survey of the position in regard to each commodity; the position in the markets of this country and of Europe?—One does it as one goes along, so to speak. The Government of India asked me for a detailed survey of the hides and skin trade and I sent them a very full report of that. Those commodities that I mention in my note: cotton, jute, hemp, kapok, tobacco, groundnuts, hides and skins, lac, rice, beans and oilcake, I mention as examples that have come before me, into which I have had to go in some detail.

53,808. It is in my mind that, in the ordinary course of your duties, you no doubt have come across defects that touch the pecuniary interest of the merchants with whom you correspond, but it is not so likely that you would come across defects which, without prejudicing the merchants in this country, are in fact prejudicing the grower and the merchant in India?—I think one comes across both; I come across the latter chiefly from the manufacturer, the ultimate consumer in this country.

53,809. You mentioned, a moment ago, that you have dealt with complaints and defects in various commodities exported from India to Europe and America, and you give a list in your note of evidence, including cotton, jute, hemp, tree cotton, tobacco and so on. We are hearing the Trade themselves in most of these kinds of produce; I do not know whether you would like, now, to give us an indication of the sort of complaints that you have in regard to each of these?—I mentioned those specially because they cover such a wide range; if you like I can take you in about two minutes through the whole of these and show you the salient points in each.

53,810. I think that would be very valuable?—Not that I can give you any details of value, but just to show as instances. The complaints in regard to cotton are two-fold: firstly, the shortness of the staple, and secondly, the quality of the fibre; that is to say, the adherence of small bits of husk and so on which prevents smooth spinning. Complaints with regard to jute are not frequent; they come during seasons when the jute crop is short, and they are always complaints of poor baling, poor material, and adulteration, sometimes, with a view to add to the weight.

53,811. *Professor Gangulee*: Excess of moisture?—Excess of moisture too, yes. With regard to hemp, it is very largely a question of dust; that is to say, retting apparently in unclean water, and apparently the use of clay in the retting in order to weight the fibre and keep it under water. So that there is an instance in which, apparently, the cultivator is following a practice which ultimately militates against the price that he will get in the market. How that is to be got round I do not know. Kapok is a very interesting question; the Mercantile Marine Department of the Board of Trade do not accept Indian kapok for the manufacture of life-saving appliances for merchant vessels; the only kapok accepted is Dutch from the Dutch East Indies. The reason is that they say they cannot be certain of the quality of the Indian kapok.

53,812. What is the difference between the quality of that which we produce and of those which come from the Dutch?—There is an inferior fibre grown in India which tends to be mixed with kapok. It does not happen to grow in the Dutch East Indies and therefore the Dutch East Indies kapok cannot help but be pure.

53,813. *Sir James Mackenna*: What is the extent of the import of kapok?—I could not say, off hand.

53,814. It is not very great?—It is not very great, but I should think it is a trade which would expand.

53,815. *Sir Thomas Middleton*: Is it mainly from Bombay?—No, from both sides of India, chiefly Calcutta and Bombay.

53,816. Is it entirely the *Bombax malabaricum* or is it a mixture?—Unfortunately, it is a mixture.

53,817. *Sir Henry Lawrence*: Is the *Bombax* better?—I cannot remember, at the moment, the name of the other fibre which is easily confused with kapok and which has no buoyant qualities whatsoever. With regard to tobacco, it is very largely a question not only of the quality of the plant but also of the curing. It seems to me that the particular conditions on which the British duty is based will have to be studied rather more carefully in India if peculiarities of the London market are to be overcome. With regard to groundnuts, the whole question is that of moistening before decortication; the result of moistening is that the proportion of free fatty acids rises during the voyage. With the help of the Empire Marketing Board, I have instituted a survey in this country of two months' complete shipments to all ports in Europe, including the United Kingdom, in order to ascertain what proportion of free fatty acids is traceable at present in the kernels. I think that will be of use to the Agricultural Department in

India to show, if one can possibly work it out in pounds, shillings and pence, what loss occurs through moistening before decortication. Hides and skins is a very difficult trade, because it is not solely the hides resulting from the slaughterhouse which are exported from India; there are a number of dead and rejected hides. There, it is a question, I should think, of demonstration with a view to proper flaying. With regard to the lac industry, the trouble really is a shortage of the raw material; with the tremendous increase in uses for electrical purposes, gramophone records, varnishes and so on, the Indian crop is insufficient. The price is enormously high and synthetic substitutes are gaining ground every year.

53,818. *The Chairman*: How far are they gaining ground because of the shortage and how far because of their inherent excellence as well as cheapness?—That is a very fair question. I should put it in this way, that, price for price, natural shellac would hold its own. The synthetic costs about 1s. per lb., which is 112s. per cwt., and if natural shellac could be got down to that price, which would give a very fair return to the producer in India, I think natural shellac would easily hold its own. The price to-day is 230s.

53,819. But when a natural product is threatened by a synthetic rival, you have to be very careful how you recommend the extension of the industry producing the natural product, do you not?—I do not think anything is going to bring down price except quantity.

53,820. *Professor Gangulee*: Are there any complaints about the quality of shellac?—Yes, there are complaints of adulteration with sand and sugar. A number of adulterants are used. With regard to rice, I had a very interesting statement the other day from the Haymarket Stores in London, pointing out that rice as prepared in India for the London market does not contain what they call the "germ." I do not know the technical side of this sufficiently to know exactly what that means, but apparently there is a great move on foot, on the part of various health societies, to provide what I suppose you might call a whole meal rice. I have been trying for some time to get a rice of that sort for the Haymarket Stores, and I have provided them with certainly three sets of samples, each of which has been turned down. I am going on trying, but there is a problem which is entirely different from any of the others before us.

53,821. *Sir Thomas Middleton*: Do the Stores assert that rice with germs is sold in any market?—Yes.

53,822. Where?—They get it from Siam. In fact, they came to me because they wanted a British rice. With regard to beans, there is the old question of the prussic acid contents in Rangoon beans. With regard to oilcake there is the question of the presence of castor traces in oilcakes to be fed to cattle.

53,823. *Professor Gangulee*: It is principally linseed, is it not?—Yes, groundnut and linseed, I should think, are the two.

53,824. *The Chairman*: Would you describe, quite shortly, the steps you take to bring these complaints, these alleged defects to the notice of the Government of India and others in India?—Yes, as I come across these I report them to the Commerce Department and to the Commercial Intelligence Department of the Government of India. The Commerce Department asked me for a full report on hides and skins, kapok and tobacco, and I will give one on groundnuts as soon as this survey is completed.

53,825. *Sir Ganga Ram*: Are your reports published by the Government of India?—Summaries have appeared in the Indian Trade Journal. On cotton, I communicate direct with the Secretary to the Indian Central Cotton Committee.

Mr. H. A. F. Lindsay.

53,826. *The Chairman*: Before we leave the question of your work in this country, Europe and America, do you think it conceivable that any organisation conducted from London could properly deal with the possibilities of the American market?—No, I do not think it can very well.

53,827. Is it your opinion that the present extent and possibilities of the American markets would justify an organisation such as yours being set up at some suitable centre in America?—I certainly think so. For instance, the interest aroused at the various Indian exhibits in America, such as those at the Philadelphia Exhibition, are beginnings which ought to be followed up.

53,828. I see, on page 209 of your note, that you are a member of the Imperial Economic Committee and also of the Empire Marketing Board. The Commission has been told by another witness that the Empire Marketing Board would be in a position, within the terms of its instructions, to make grants for certain purposes to institutions working in India; is that so?—Yes, on the understanding that the enquiry and the results thereof will be of Imperial interest.

53,829. Are there openings, do you think, within the conditions that you mention, for submissions to the Board for grants?—I have already got one grant through the Board for the survey of the groundnuts position; that has been sanctioned and the survey is now being completed and is about halfway through. The next one that I propose to put to the Board is the water hyacinth. I have got a memorandum from the Commercial Intelligence Department by last mail showing the position of the water hyacinth plague in India, and I propose now to get into touch with the other Dominion offices and find out whether they would support me in a reference to the Empire Marketing Board.

53,830. *Professor Gangulee*: What do you propose to do with this problem of the water hyacinth?—It is a question of research; whether it could be undertaken in Kew, or where, would be a matter for the Empire Marketing Board to decide; it might be referred to Trinidad; I do not know.

53,831. *The Chairman*: What you want is the money?—We want the money for research.

53,832. *Sir Henry Lawrence*: How is that a matter of Imperial importance?—It is affecting Canada also.

53,833. Australia?—I am not sure about Australia; I want to find that out; it certainly is in Canada.

53,834. *Professor Gangulee*: Your research, I understand, will be directed to finding measures for the eradication of water hyacinth?—Yes.

53,835. How much are you expecting from the Empire Marketing Board?—It may be something very small, if it is only a matter of research with existing laboratories and existing staff; but if they have to put special staff on to this it might cost anything.

53,836. Will the research be conducted here or in India?—That will have to be decided according to the laboratories available, and so on. I think it probably would be research into the possibilities of chemical destruction.

53,837. *The Chairman*: Is the position with regard to the Empire Marketing Board and its grants understood in India?—They are very good on the publicity side; they send out full information with regard to Board activities to a list of over 100 newspapers which I have given them, and I think the Press in India has given pretty wide publicity to those activities.

53,838. For instance, do you think the research officers working under the Government of India, the provincial officers and their research officers, all know of the existence of the Empire Marketing Board and the fact that there is money waiting, provided the conditions are complied with, to go towards research in Indian subjects?—The Government of India certainly know.

53,839. These things are not always as well known as might be supposed; have you not noticed that?—I have noticed that, certainly; there is a publication just coming out now, by the Empire Marketing Board, which is going to be very freely distributed throughout the Empire, showing their activities.

53,840. Do you suggest that the principle of the Indian Central Cotton Committee should be applied to other crops in India?—Yes, I think so.

53,841. What crops are you thinking of?—I was thinking particularly of rice and wheat; in fact, those crops which would contribute towards the scheme. A list is given in the first note that I submitted.

53,842. That is in your note which we have had before us for some time?—Pages 802 and 203.

53,843. If this principle of the cess on agricultural produce exported from India were to be applied and the resulting funds devoted to the improvement of agriculture generally in India, it would, I take it, involve standing taxes, levied on one particular crop being spent on crops which made no contribution; is that so?—Yes.

53,844. And, as crops are disposed to some extent geographically, it might be that important districts receiving benefits would be making no contribution; do you think that is possible?—They would make a regular contribution; I cannot think, off-hand, of any Province that would not be.

53,845. I spoke of districts?—I cannot think of any district which would not be contributing something under this scheme.

53,846. *Mr. Calvert*: You mean to one or other of these?—It would be producing one or other of these crops.

53,847. *The Chairman*: And it is, broadly speaking, on that contention that you found the equity of the scheme?—I believe in a principle under which the man who is going to benefit has got to pay up for the ultimate advantage he reaps. That 3,429,000 tons of food grains, for instance, comprise a very wide range indeed.

53,848. Why do you prefer proposals for financing research in India by a cess on produce exported rather than financing such research out of general revenues?—Because the grant from general revenues is always liable to revision at Budget time; this grant would not be.

53,849. Do you think the principle of special taxation for particular purposes is sound finance?—If you consider the scheme, it is really one under which Government does not tax so much as assists the industry to tax itself; for example, it was the cotton industry which went to Government and asked Government to impose the cess, collect it and hand it over. I do not call that taxation.

53,850. I suppose the function of the Chancellor of the Exchequer is only to show people how to tax themselves, but that does not seem to make his efforts any more popular?—The Road Fund shows what he does with it afterwards.

53,851. With regard to the list of products which you gave us, have you had no complaints about wheat?—I cannot remember any complaints about wheat.

53,852. Have you any views about the purity of the Indian wheat that comes into Great Britain?—I believe, on the whole, it is good.

53,853. You do not think there is deliberate adulteration by dirt and dust?—I have had no complaint, anyway. It happens that I have not been thrown in close touch with the millers; but I think if they had had serious complaints they would have been in close touch with me.

53,854. *Sir Ganga Ram*: What is the standard; when they speak of standard wheat in India does not it mean wheat adulterated with five per cent. barley, two per cent. mud and one per cent. of other things? Is that

expression not known amongst the merchants here: "standard wheat"?—I cannot remember the exact terms of the contract, but I think it is a clean basis contract.

53,855. Are you quite sure?—There may be certain allowances.

53,856. *The Chairman*: However, you tell the Commission that that is a crop with which you are not particularly familiar?—I have not been brought into specially close contact with the London market for wheat.

53,857. *Sir James Mackenna*: With regard to your suggestion of a cess on crops exported, of a total of nearly 86 lakhs provided by food grains the quantity of which is given as 3,534,000 tons, 2,800,000 tons would be Burma rice; which means that out of your total of Rs.1,63,00,000, Burma would probably be contributing from 65 to 70 lakhs. Do you think a proposal of this kind would be likely to be accepted by the Government of Burma with any enthusiasm?—I had not contemplated that the whole of this sum would be pooled in one big organisation and then handed out; I had contemplated that rice should form a special fund of its own, and wheat probably a special fund of its own, and that possibly the other crops, *jowar* and *bajra*, might be pooled together. Then the oilseeds might be pooled together, hides and skins separately and so on. I think experience would have to show what sum was necessary in each case, and the actual amount of the cess would be varied accordingly.

53,858. Have you considered the possibility of an acreage rate as opposed to the idea of an export cess? I am thinking of an acreage rate, on a minimum land revenue assessment below which you would not put the rate on; for instance, land paying one rupee of land revenue would pay nothing, but land paying revenue above that would pay the rate proportionately on a sliding scale?—Yes, I considered that, but I think, on the whole, it would not be a sound basis for a scheme of this sort. I think it is very important that the scheme should work by commodities, so that one would tend to assess the cess payable in accordance with the requirements of the industry concerned. You would not get that under a general land rate.

53,859. It would be too rigid?—It would be too rigid. Also, of course, there is the question of whether that addition to the land rate could go into any general pool; each Province would know it was contributing so much and would tend to ask for an equivalent return within its own boundaries.

53,860. Do you think the principle of the Cotton Committee would be applicable as easily to any of these other crops as it was in the case of cotton? In cotton you deal with a fixed unit which is the bale; practically all cotton brought to a factory is liable, in addition to exported cotton?—I think it would be almost easier, because you would collect only at the point of export.

53,861. Whereas, with regard to cotton, you are collecting at both?—Yes. With regard to oilseeds, for example, you would assess the cess at the point of export of your oilseeds, oils and oilcake, and the funds would go back to various improvements in the crops for demonstration with a view to the utilisation of the oilcake for manures.

53,862. But the difference is that in the case of cotton all cotton pays, whereas in the case of these other crops only the exported portion would pay?—That is right.

53,863. *Professor Gangulee*: You have stated that you pass on to the Director of Commercial Intelligence in India any complaints with regard to adulteration of Indian produce?—That is right.

53,864. Is there any attempt, do you know, in India to inform the producer about the nature of these complaints?—Yes, the Director General

of Commercial Intelligence passes on the information to the authorities concerned. For instance, with regard to hemp, to take that as an example (I instance hemp because hemp has come into great prominence recently and I have been very closely into that question): I think, on the whole, hemp is an industry which, with care, could be greatly improved. The actual quality of the Indian fibre is, on the whole, good; it is the method of preparation which damns it, if I may say so, on the London market. Now the information that I have given the Director General of Commercial Intelligence about hemp was passed on to the various agricultural departments concerned.

53,865. Do you know what measures agricultural departments in India take to disseminate such information among the actual growers?—The reply that I got was that if the Trade wanted to protect itself it had only got to insert a condition in its contract by which dirty or dusty hemp was penalised out of the London market. The agricultural departments replied that the London trade had its own remedies in its own hands.

53,866. You refer to jute adulteration. I have never seen a single poster or a single leaflet or any propaganda by the Director of Agriculture to inform the jute cultivators that such complaints arise at the trading centres?—I do not know what happens at that end; there has been no complaint since the crop was a heavy one.

53,867. To whom, in India, do you refer inquiries relating to agricultural produce besides the Director of Commercial Intelligence?—He is my counterpart in Calcutta and all information that I get likely to be of value to the producer in India goes to him; he is the man who disseminates it.

53,868. You do not deal directly with the Directors of Agriculture?—No, not with the Directors; sometimes I correspond direct with Pusa, and sometimes, for timbers, with Dehra Dun.

53,869. *The Chairman*: In cases where you do correspond with Pusa or Dehra Dun I suppose you would send a copy of the correspondence to the Director General of Commercial Intelligence?—No, I think, on the whole, the things that I correspond direct with Dehra Dun and Pusa about are matters which do not interest the Commercial Intelligence Department: for instance, exhibits of particular classes of goods for the Imperial Institute here or anything like that.

53,870. *Professor Gangulee*: In March, 1926, you state in your report, the inventor of a patent process for baling of oilseeds was advised to communicate with the Agricultural Adviser, Pusa. Do you know what has been done with that? Has that been followed up?—That is the McIlwaine process; it has been known to the London market certainly for 10 or 15 years.

53,871. You transmitted the information to the Agricultural Adviser, Pusa, and you do not know what steps are being taken to test it?—I do not think I transmitted any; I advised him to communicate direct with Pusa, but I advised him first to get into touch with the London importing firms.

53,872. Similarly in Bengal, I see the Director of Agriculture was sent full particulars of a German process for the extraction of fibre; do you know whether that method was followed up, tested or experimented on?—I do not know; in many cases I put the authority in India in direct touch with the person from whom I got the information.

53,873. I also notice that the Director of Commercial Intelligence was given sufficient information as to the improved methods of preparing hemp for the London market; do you know what he has done with that information?—He passed it on to the Directors of Agriculture, and the reply came back to me: If the London market wants to look after itself, it has the remedy in its own hands.

53,874. But you have not seen any distinct change in the quality since you reported this matter?—No, absolutely no change, as far as I know.

53,875. Do you think there is a prospect of bulk storage of wheat in India?—I have had no suggestions from the trade that it would be a good thing if that were introduced. I have not made any special inquiries at this end as to the advantages of a system of bulk storage. I have discussed the Canadian system very closely with the Canadian experts, but I have never had any suggestion from the trade that it would be a good system to introduce in India.

53,876. The Empire Marketing Board have prepared a memorandum on irrigation; do you know whether the Department of Irrigation in India took part in its preparation?—The Empire Marketing Board have prepared a questionnaire which is going out to India; it has not actually gone out yet.

53,877. Up till now, how much money have you received from the Empire Marketing Board for research on groundnuts?—I obtained a grant for whatever sum might be necessary to cover that; for instance, the Government laboratory here had to employ a special assistant to analyse all samples.

53,878. How much have you had already from the Empire Marketing Board for the investigation of oilseeds?—I cannot say; it is only half completed.

53,879. *Mr. Calvert*: In discussing the question of the variation in prices for commodities according to their quality, have you worked out whether the effect of this range of prices reaches down to the cultivator; is it a sufficiently big range to affect the price which the cultivator gets?—To take an example: prime dressed hemp will fetch £40 to £45 a ton in London; the ordinary undressed hemp will command a very much lower price; I cannot say off hand what it would be; I should think it would be in the neighbourhood of £20, if as much. We have to fight the Russian hemp and the Italian hemp.

53,880. *Professor Ganguleе*: Italian hemp is coming into the market?—Italian hemp is in very good condition, but no better quality; the original quality of the fibre is no better than the Indian.

53,881. *Mr. Calvert*: You have never tried to work out what the difference per acre is on the range of prices?—No.

53,882. It is merely a question as to how far it is worth our while to bring these matters to the notice of the cultivators, or merely to the notice of the larger traders?—I am thinking of it more from the point of view of India's export values.

53,883. With regard to your proposed cess on exports, who, in your scheme, would pay that cess?—The cultivator.

53,884. Do you think the cess would affect internal prices in India?—Not if it were moderate enough, and if you see the range of rates that I propose, such as three annas per cwt., I do not see how those could affect internal prices in India.

53,885. Two annas per cwt. on a sixteen maunds crop, say in a Punjab colony, would work out at Re.1—8—0 per acre, which is higher than the land revenue. Would you still levy a research cess equivalent to the land revenue?—They would get more than that back again.

53,886. You think it would be justifiable to levy a high cess on certain people and not on others?—The cess would operate practically as an addition to the costs of marketing, just as much as if you were to put two annas per cwt. on the total railway freight from the field to the port; it must be paid by the cultivator.

53,887. The Fiscal Commission, I think, adopted twelve per cent. as the proportion of wheat exported; if that is correct, then an acreage cess of

one-eighth of your sum would yield the same income?—I do not quite follow that.

53,888. They took a figure of the total produce of India, and found that twelve per cent. was exported in the case of wheat and five per cent. in the case of rice. I do not guarantee the figures; they are the figures adopted by the Fiscal Commission?—I do not accept, for a moment, that twelve per cent. of India's production of wheat is exported. Certainly that is not so at the present time.

53,889. That is the figure they gave; I took that as a figure found by a previous Commission. It was five per cent. in the case of rice. That would mean, in the case of rice, that an acreage cess of one-twentieth of your proposal would yield the same revenue, and in the case of wheat one-eighth would?—Yes, that is so. But you would not want the same revenue in both cases.

53,890. Why not?—Because your problems are entirely different in the case of wheat from what they are in the case of rice.

53,891. I am assuming you want to get this sum you have fixed here: 85 lakhs of rupees?—This is only a general scheme showing how much you can obtain from a small cess on exports, but the actual amounts you require from each particular industry vary with the industry, and your assessment of the real rate would depend on your Budget estimate of what you require to spend on that particular industry.

53,892. *The Chairman*: Would you, in every case, devote the proceeds of the cess on a particular crop to the improvement of that crop and nothing else?—Yes, on the same lines as the Indian Central Cotton Committee.

53,893. *Mr. Calvert*: You do not fear an outcry that certain Provinces would pay the whole of, say, an investigation on rice and other Provinces which do not pay at all would get the benefit?—I think it has got to be faced.

53,894. *Mr. Noyce*: The acreage under rice in Burma is 14 per cent. of the total acreage in India, and the exports are over 80 per cent.; so that Burma with an acreage of about one-eighth would pay four-fifths of the sum?—Yes, I quite agree.

53,895. *Sir Henry Lawrence*: In some recent debates in the Legislative Assembly in Delhi, the statement was made by one side that the interest of the Indian agriculturist in the imports into India was limited to seven per cent. of the total. Do you know of any machinery existing in India which can either verify or refute that statement?—If it were put as a special enquiry to the Director of Statistics, I daresay he could work it out, but I do not know whether he would have to employ a special agency to do so; I should think he probably would. I do not know of any existing agency which would give that information.

53,896. Perhaps you noticed the statement made in the discussions on the ratio of the rupee?—No, I have not noticed that.

53,897. It was not disputed, it was not criticised in any way by the speakers on behalf of Government, and it seemed to be a fair inference that they did not know?—Yes. I do not know; I have never seen that calculation made officially.

53,898. It would be of some importance to know where the trade goes; whether it goes to the urban resident of India, to the agriculturist or to the industrialist?—The Taxation Enquiry Committee did work out roughly what the cultivator paid in duties per annum, I think.

53,899. But do you not think there is any machinery which observes regularly, from time to time, what are the channels of trade and to what sections of the population the import trade goes?—I doubt if you would find that machinery in any continental country; you might find it in Germany.

53,900. Does the Department of Overseas Trade here give any attention to this particular problem? They have their representatives in India, but is it any part of their function to watch to what section of the population the trade is going?—Yes, of course they particularly watch demands; they would, for instance, watch very carefully the substitution of artificial silk goods for cotton goods.

53,901. And have they got the staff and machinery for conducting such enquiries?—They have got their own Trade Commissioners in Bombay and Calcutta, and I daresay they have their own unofficial sources of enquiry.

53,902. Do the Trade Commissioners maintain a staff?—A small staff.

53,903. Is that Overseas Department still in existence?—Yes.

53,904. It has not been recently retrenched?—It has been threatened, but not retrenched.

53,905. And if it is retrenched, then this machinery ceases to function?—I do not think so; I do not think the idea is absolutely to eliminate the department altogether; I think it is to re-amalgamate it with the Board of Trade.

53,906. You are a member of the Empire Marketing Board and the Imperial Economic Committee; in that capacity are your functions still limited by your scope as Indian Trade Commissioner to observe and consider exports from India only, or do you take on your colour from your surroundings and consider exports from the Empire into India?—The real functions of the Imperial Economic Committee are to encourage the sales of Empire produce in the London market. Now, it stands to reason that if I can help the Australian in an enquiry for marketing his dairy produce in London, I can count on his co-operation in my turn when we are considering the question of tea. But the whole thing is the focussing on the London market, on the United Kingdom market. There is no question of the outward drift of trade. The Empire Marketing Board have executive functions in two chief directions; research for Imperial benefit and publicity which will make home and Empire produce more widely known.

53,907. Recently there has been a discussion in India as to the competition in regard to piece goods between Japan and Lancashire and Indian mills. Have you any information or any source of information as to whether the agriculturists in India derive their piece goods mainly from Japan or Lancashire or Indian mills?—I have the import trade statistics published by the Government of India.

Mr. Noyce: In self-defence, I ought to say that you will find it all in the Tariff Board's report.

Sir Henry Lawrence: Which was issued within the last few days?

Mr. Noyce: Yes.

53,908. *Sir Henry Lawrence*: That is precisely my point; there is a special investigation made by the most able officers in India to ascertain this point, but is there any machinery for carrying on the observation of such important channels of trade?—That is entirely an Indian machinery, of course; that is not connected with the London market for Indian goods.

53,909. I am asking you on your previous knowledge of machinery existing in India?—As Director General of Commercial Intelligence I had to go into questions like that, and I found that the best source of information in answering such questions was the trade itself. The trade itself was always very willing to help me.

53,910. And it is well-informed on the point?—It is its bread and butter.

53,911. You mean they ought to be well-informed?—One had to choose one's expert to see that one got a person who was reliable and who had the information.

53,912. With regard to markets for agricultural products, do you consider that the higher grades of agricultural products in India find their consumers

chiefly among other agriculturists, or among urban and industrial sections of the population?—That is to say, in the United Kingdom markets?

53,913. No, in India; I am still going back to your previous experience rather than your present position?—The agricultural produce of the country, so far as food grains are concerned, is chiefly for local consumption, but whether it is chiefly for urban or rural consumption, which I think is your point, I have never gone into that question.

53,914. Is there any officer or any machinery in India which keeps such a point of view before them?—There is nobody specially deputed to maintain statistics of that sort, as far as I know.

53,915. Taking the population in India, broadly, as 300,000,000, 60,000,000 of that would be urban and industrial, and if you take the better class of agricultural products, spices or fruit or special varieties of scented rice, whatever that maybe, do the ryots who grow those things find their customers in the cities and in the better-to-do sections of the population, amongst the industrialists and commercial population, or amongst the ryots themselves?—I am afraid that is beyond me; it is five years since I left India.

53,916. The external market for Indian products absorbs a comparatively small percentage of the total products of India?—Yes, I worked it out at one time, and I discovered that about one acre out of every eleven is devoted to export. That is a very rough estimate.

53,917. So that the internal market is about ten times as important as the external market?—Most certainly.

53,918. The Fiscal Commission, a few years ago, found that while England was supplying higher grades of industrial goods, India might hope to supply the lower grades, and they advocated the encouragement and improvement of industries in India on that ground and with that view. Do you know of any machinery existing in India to discuss the progress of Indian industrial effort?—I am afraid the Indian markets are rather beyond me; I am interested in the foreign markets for Indian goods.

53,919. I know you are now, but you were Director-General of Commercial Intelligence in India, and as such were you not concerned with Indian trade internally?—Yes, to a certain extent. There was a movement to divide the work of the Commercial Intelligence Department into two parts: the commercial and industrial sides. The bulk of the work of the department was connected with overseas markets. We worked in with the Directors of Industries, with regard to local markets; but in my time, I am talking about five years ago, the bulk of the work was in connection with overseas markets.

53,920. Then I will leave that. You spoke of the work of the Indian Central Cotton Committee; do you think that has been successful?—I certainly think so.

53,921. A previous witness told us that its success was largely due to the work of the Bombay merchant princes on that Committee; do you accept that view?—I do not know that one can really allocate the responsibility; I remember that a number of members of the committee, whose advice and assistance were extraordinarily helpful, were not necessarily Bombay merchants. I can remember the Nagpur cotton mill owners, whose advice was very helpful.

53,922. The unofficial co-operation was very important?—Very important.

53,923. Do you look to obtain similar unofficial co-operation in regard to these other committees, the creation of which you contemplate for rice and wheat and so forth?—Yes, certainly.

53,924. You think the men to do that kind of work would be obtainable in India?—I think so.

53,925. *Sir Ganga Ram*: Do you issue any bulletin for the guidance of people in India as to what things can be profitably exported?—No; the

organ of the Department of Commercial Intelligence in India is the Indian Trade Journal which is a weekly publication.

53,926. But that does not give this information; I have sought for it, but it is nowhere to be found. Is there a bulletin to guide the people as to what things can profitably be exported from India. I will give you an instance: I observed, the other day, that there was a large export of blood from slaughter-houses from India to Germany of a substance which was later exported to India in the form of manure. I want to know whether there is any machinery in your department to guide the people as to what things they can export and what things they can employ for local industry?—I should think that would be the function of the Directors of Industries.

53,927. Do you send any information to Directors of Industries?—The Commercial Intelligence Department pass on, to the Directors of Industries, information as to openings for the development of local industries. I can give you an example of that if you like; there is the question of the import of artificial butters, vegetable butters, into India from Holland and other parts of the Continent; the import, particularly from Holland, has increased enormously during the last year or two.

53,928. I am speaking of stimulating export: do you issue any bulletin to guide the Industrial Department in telling the people what can be usefully or profitably exported?—I was giving this example of oil seeds exported from India to the Continent, made into vegetable butters and re-exported to India. That information will have reached the Directors of Industries from the Commercial Intelligence Department in Calcutta.

53,929. Will you kindly inquire from the merchants whether the expression "Standard wheat" is used here as meaning pure wheat?—I think you are going to get that evidence from the London merchants.

53,930. The exporters in India quote to the cultivators the rate for standard wheat, which they regard as being wheat with eight per cent. of adulteration, five per cent. of barley, two per cent. of mud, and so on. Will you kindly make inquiries whether that system is still in vogue or not. We should strongly object to that system being maintained in future in the interests of the growers, who always grow pure wheat, the adulteration being done by somebody else, though I do not know who it is?—Yes, adulteration does not always take place in the hands of the cultivator, by any means.

53,931. Do you arbitrate between merchants here who export or import and the Indian merchants, in case there is any repudiation of obligations on one part or the other?—Yes. I am not in a position exactly to arbitrate, but I do bring pressure to bear on importers here who have tried to repudiate consignments from India or debts due to India; I try to bring pressure on them to make the necessary payments.

53,932. Is it publicly known in India that any complaint they may have in regard to importers or exporters may be brought to your notice and will be officially adjudicated upon?—From the number of complaints I receive, I should think it is very well known.

53,933. In India?—I should hesitate to handle twice the amount of work I have at present.

53,934. Have you pointed out the inconsistency of the state of things by which agricultural implements are admitted into India free, while, if any firm starts making implements in India, they have to buy raw material which has already paid duty?—That, of course, is on the border line between development in India and export to India. I have got inquiries of that sort; if I get an inquiry of that sort, I certainly follow it up.

53,935. Have you ever visited the factories for the manufacture of the so-called vegetable *ghi*?—Here in England?

53,936. In England, or Holland, or wherever it comes from?—Yes, I have visited a factory.

53,937. It would be an advantage if you could certify that that *ghi* really does not consist of any things which are repugnant to the religious sentiments of Hindus or Mahommedans?—I have never come across that.

53,938. About ten miles from here, there is a margarine factory in which they use beef grease and pig lard; I have seen it myself?—If I got a complaint from India, I should certainly go into it.

If you could certify that the margarine does not contain such ingredients, it would be a great advantage to the trade and to the people?

53,939. *Sir Henry Lawrence*: These are imports into India, with which you are not concerned?—I am not primarily concerned with them, but I am concerned with the development of the industry in India; that is the only way in which I come into contact with it.

53,940. *Sir Ganga Ram*: Do you publish any reliable reports with regard to American weather conditions, because that is of great interest in India in reference to cotton and wheat. At present the weather conditions are reported wrongly by speculators?—I think the Meteorological Department in India probably makes its own arrangements for getting information; the Meteorological Department does not rely on me.

53,941. It would help Indian trade if you published a reliable and authoritative report as to the weather conditions in America, as to whether the cotton crop in America was likely to fail, or was in good condition and so on?—Yes, I do send out reports on that; I am reporting at the present time on the condition of the cotton crop.

53,942. Is that published in the Trade Journal?—Whether it is or not I do not know; it goes to the Commercial Intelligence Department and the Department of Commerce.

53,943. Can you say to what extent the tariffs imposed within the last four or five years have benefited India? I mean the Indian people; of course I know they have benefited the Indian Finance Member?—Which tariffs do you mean?

53,944. Those on sugar and so on. For instance, has the high tariff on sugar decreased the imports into India, because that was the object of that tariff?—That is not the side of it with which I am interested; I am interested in Indian exports, not in Indian imports.

53,945. But you are considering the development of Indian trade; all I say is: Have these tariffs in any way benefited the Indian people?—My interest is in the overseas markets for Indian goods.

53,946. *Sir Thomas Middleton*: You have just told Sir Ganga Ram that you have taken some interest in the exports of vegetable butter and *ghi* to India; is it the case that both margarine and *ghi* are exported, or is it margarine only which is exported?—I think it is called a vegetable butter, or vegetable lard; it is a margarine, but whether it is sold in India as an artificial *ghi* or not, I do not know. I should think it probably is.

53,947. I want to know whether, when it reaches India, it is converted into a *ghi*?—It is sold for the same purpose, of course, as a cooking butter.

53,948. You mentioned the great expansion of the trade, and it occurred to me that the trade could not be a big one unless it was converted into *ghi*?—I did not know that any further process took place in India; I rather doubt it; I should think it is shipped from Holland in the condition in which it is ultimately sold in India.

53,949. Have you taken an interest in trying to develop the margarine industry in India itself?—That is exactly the point that I have taken up. I have been asked by the Minister for Agriculture in the Punjab whether I can obtain for him specifications of plant which will enable the whole of that industry to be developed in the Punjab. I am trying to get that plant now, and I find the greatest difficulty in getting it.

53,950. You made reference several times to the question of fibres, the quality of fibres, especially with reference to hemp. Are you in direct touch with the Board of Trade Committee on Empire Flax?—Yes.

53,951. They have accumulated a great amount of information on these various fibres?—Yes.

53,952. And as to persons who have patent processes, &c.?—Yes, I am in touch with the Board of Trade over that.

53,953. To what extent has India benefited by the preference on Imperial tobacco? Have you followed the increase in imports since that preference was granted?—You will find that in my Report on page 25.

53,954. There has been, notably in the last year, a great increase in the total export of leaf, but the cigar trade, which is the most valuable from the Indian point of view, is about stationary?—Yes, that is true.

53,955. That of course is due to the method of assesssing the duty in this country?—The duty is too high and is assessed by weight.

53,956. What is the duty on Indian leaf, manufactured into cigars, which arrives manufactured? I think it is somewhere about 14s.?—Yes.

53,957. The general duty is 15s. 7d., while that on Indian leaf I think is about 12s.; there is a small preference?—Yes. There is a 25 per cent. preference.

53,958. Has the question of an *ad valorem* duty ever been raised with a view to increasing the Indian trade in cigars?—Yes, I raised that in a Report which I submitted to the Government of India before the Imperial Economic Committee of 1923.

53,959. What was the fate of it?—That went in as one of the reports to the Committee, but I do not think it was taken up. I doubt if the manufacturers here would like it.

53,960. We do not mind about the manufacturers here; we are thinking now of Indian tobacco?—From the point of view of India, it would be an excellent thing.

53,961. The method has always been a duty on weight, except during the War, when there was a surtax, I think, on an *ad valorem* basis?—Yes.

53,962. If it is possible to impose an *ad valorem* duty during the War, it may be possible in peace time?—Yes.

53,963. That is a point which I think we must follow up?—I should not think there would be much difficulty from the administrative point of view. I understand the manufacturers here are averse to any such duty.

53,964. That is to say, the British manufacturers of cigars are averse to it?—Yes.

53,965. It is quite clear why they should be?—Yes.

53,966. If you will look at the exports of Indian cigars to the United Kingdom and compare them with the exports to the Malay States, you will find that the Malay States, alone, purchase four times as many cigars as we do?—Yes.

53,967. There is obviously a market in this country which we are not securing, because of some impediments which are being put on the cigar manufacturers of India?—Yes; I do not think it would require much reduction to make the Indian cigar popular here. The Indian cigar is about 4d. or 4½d. at present; there would be a demand for cigars at 2½d., which is a demand which the Indian cigar could very well meet.

53,968. A comparatively small reduction would make a great difference in the demand, one would suppose?—Yes, if you call a reduction from 4½d. down to 2½d. a small reduction.

53,969. That is, of course, a very big reduction?—It is practically half the existing duty.

53,970. The reduction will not come from the half of the duty altogether; the price of the cigar is made up of duty, cost of production, *plus* retailers' profits?—Yes.

53,971. The duty enters into the retailers' profits at this end?—Yes.

53,972. With regard to your export cess, in reply to the argument that Burma would be paying a disproportionate amount in regard to rice, you said in your preliminary note that Burma at present benefits from the investigations of the Indian Central Cotton Committee financed by exports from India and levied on Indian mills. But surely, the Cotton Cess Act applies to Burma too, does it not?—Yes, but the amount of cotton grown there is comparatively small.

53,973. It is comparatively small, but they export the whole of it, 90,000 bales or so, and therefore they are paying their proportionate share. Your note seems to imply that they pay nothing on cotton, but they are paying on the whole of their exports, and they cannot do more than that, can they?—They are not paying on their exports to India. I suppose the Burma cotton, which is ultimately consumed in Indian mills, or exported from India, has to pay a duty..

53,974. I think the whole of their outturn is exported abroad. The Annual Statement of Seaborne Trade only refers to exports abroad, does it not?—It does not refer to coastal trade.

53,975. Then practically the whole of their outturn goes abroad?—I must admit that: that they are undoubtedly paying on their crop exported abroad.

53,976. I am not quite clear about your exact position: do you propose that the proceeds of your export cess should be administered by one general committee and not by a series of crop committees?—It would be a central organisation divided up by commodities. You would have a sort of Development Commission in the centre, which would have a rice section, a wheat section, and so on, and they would have their corresponding committees in the Provinces.

53,977. Would you bring the Central Cotton Committee into that?—No, I would leave it out.

53,978. Why?—On the principle of leaving well alone.

53,979. Do you think it would be possible to establish a satisfactory Jute Committee? You have had considerable experience from the inside of the jute industry as Director-General of Commercial Intelligence and Secretary to the Government of India; we have been told by several witnesses that there would be great difficulty in establishing a satisfactory Jute Committee, because the interests of the cultivators of the mills, and of the exporters are so conflicting: is that your view?—I should not have thought they were more conflicting than in the case of the cotton industry, where both the grower and the manufacturer are represented on the same committee.

53,980. Yes, but the mills and the exporter are interested in getting a better type of cotton, while the idea seems to be that the jute exporters are not interested in getting a better type of jute; they do not really care much about the quality?—But the Jute Associations have contributed towards Mr. Finlow's scheme for the distribution of better seed. Does not that show that they are interested in better quality?

53,981. Apparently not, because we have had some evidence that they are unable to distinguish the better jute in the crop; the representative of one of the big jute firms in Calcutta said they were unable to distinguish the improved jute in the crop?—I understood that Mr. Finlow's improved jute was very generally recommended by the jute mills, and that they were so anxious to get it that they have contributed towards this distribution scheme. I should hesitate very much before accepting evidence to the contrary.

53,982. From your knowledge of the jute trade, you think a Jute Committee could be satisfactorily worked?—I think it could.

53,983. I think you will agree with me that, thanks to the personal contact Sir David Chadwick established with the City, the Indian Trade Commissioner is now able to obtain the best expert advice on any subject that comes up?—That is certainly so.

53,984. Do you consider it has been a great handicap to the Indian Trade Commissioner from the purely commercial point of view, which, after all, is the chief justification for his existence, that his office has been moved to Grosvenor Gardens from the City?—I think so, most distinctly; it has handicapped my work very much indeed.

53,985. As so, I take it, has the attendance on numerous committees?—Yes, that has taken up a good deal of my time.

53,986. It makes it very desirable that assistance should be given so as to ensure that there shall be somebody always in office to answer commercial inquiries?—That is true.

53,987. I notice that you are on various committees connected with the Imperial Institute. Could you give us the exact position of India in relation to the Imperial Institute now?—The relationship is getting very much closer; that is to say, the various expert departments in India are placing more and more inquiries with the Imperial Institute. I deal with those inquiries as a member of the various technical committees before whom they come.

53,988. Is India subscribing to the Imperial Institute at present?—£1,200 a year for the maintenance of the Institute, but nothing towards the Indian Gallery.

53,989. Have you any suggestions as to the way in which the Imperial Institute could be made of more use to India?—I think the Indian Gallery ought to contain a better show of Indian goods. The technical committees are doing excellent work at the Imperial Institute and are gradually becoming better and better known in India. Technical officers in India are coming more and more to place inquiries with the Imperial Institute, particularly with regard to these industries in which the Institute is specially interested.

53,990. Do any of those inquiries relate to matters dealing with Indian agriculture?—The Hemp Enquiry certainly does. I beg your pardon, the Hemp Enquiry did not come from India; the Hemp Enquiry was developed on this side. An enquiry from the Director of Industries in the Punjab for an up-to-date plant for crushing oil seeds, or extracting vegetable oils, is being dealt with by the Imperial Institute.

53,991. I see you are a member of the British Empire Producers Organisation and of the Tobacco Committee. Are any Indian producers members of that organisation?—No, they are importing merchants here, representing the producing firms in India.

53,992. India is connected with the organisation?—Yes, India is connected.

53,993. Otherwise, there would be no justification for your belonging to it I presume?—I think it is important that India should be represented on the British Empire Producers Organisation.

53,994. *Mr. Calvert*: At the time of the late Exhibition, there was quite a sharp demand here for the products of Indian village industries, such as lacquer work, toys, and small rugs?—Yes.

53,995. The kind of thing that villagers can turn out?—Yes.

53,996. Is there any hope for extension on those lines?—Yes, I think there is, by means of the cottage industry. I have had an inquiry from the Punjab as to the possibility of the development of cottage industry with electrical power applied in the cottages. As a matter of fact, next week I am to meet

a representative of the Federation of British Industries to discuss that question and see what plant can be obtained which will be suitable. I certainly think that the market is very well worth developing.

53,997. Is there any hope at all for the development of handwoven silks?—Yes. I should, on the whole, prefer that this came from the Government Artware Institute in India. In fact, if those institutes had some method of stamping their own product, or those products which they themselves have passed, they would obtain a very much better sale in this country than they do. At present, there is nothing to distinguish them from the work which they have already rejected in India. They exercise a very valuable function in scrutinising and passing or rejecting cottage work.

53,998. There used to be a considerable import,, into this country, of wooden toys from Russia and Germany; do you think that trade could be captured by the Indian cottage worker?—Not as it stands at present; the Indian cottage worker would have to revise his methods considerably. I think he would have to specialise in mechanical toys, because the demand nowadays is largely for mechanical toys.

53,999. *Sir Thomas Middleton*: Are you in touch with the Rural Industries Bureau?—I sent a collection of their publications to the Minister for Agriculture in the Punjab, because they included some very valuable reports which had a bearing on an enquiry which I had received.

54,000. If you are enquiring into the toy market, I may say that they have a very good library dealing with the Continental position; you might find some useful information there?—Yes, I will remember that.

54,001. *The Chairman*: In answer to a question put by Mr. Calvert, you spoke of the possible market for hand-woven silks. How far, in these days, is it true that cottage industries are capable of producing art silks, and materials of that nature, which cannot be produced on a factory loom?—They do produce, particularly in Bihar, silk products which obtain a very ready sale in this country.

54,002. Is it not the tendency to-day for factory mills to expand, and expand their variety both as regards form and colour? The range of goods produced under factory conditions is growing much wider, is it not?—Yes, it is growing wider, and they are actually imitating the roughnesses of the hand-woven products.

54,003. They are making cottage industry wares in factories?—Yes.

54,004. Deliberately imitating the attractive minor faults and roughnesses associated with handicraft?—Yes, that is so.

(*The witness withdrew.*)

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NOTE ON AGRICULTURAL EDUCATION.

The last century has witnessed an enormous advance in scientific knowledge, much of which has an intimate bearing on agriculture, while during the same period there has been a growing consciousness that for various political, social and economic reasons agriculture occupies a position of peculiar importance in the national economy. Hence has resulted an almost universal formulation of policies which have in view the fullest exploitation of agricultural resources and the maintenance on the land of the maximum population which it can support on a due standard of comfort. With modern transport facilities the products of the soil find a world market and, midst every increasing competition, the nation which does not take full advantage of advance in knowledge must suffer serious handicap. It is only natural,

therefore, that in the varying measures adopted for the furtherance of agriculture special prominence has been given to the development of agricultural education.

The initiative, in this respect, has come in greater degree from those responsible for shaping agricultural and educational policy than from those actually engaged in the agricultural industry, who only slowly are beginning to recognise that traditional methods, epitomising the hardly bought wisdom and experience of the past, can derive substantial aid from modern science. In the East, progress in this direction has been, and is bound to be, much slower than in the West. General education is more imperfectly developed, the force of tradition is, if anything, stronger and, amidst much excellent agricultural practice, there is less professional pride on the part of the agriculturist in the efficient management of his holding. Again, in the East, economic conditions are generally such that the farmer maintains himself not much above subsistence level, and consequently can less afford to risk departure from existing practice.

A complete system of agricultural education makes provision for instruction at (1) elementary, (2) intermediate, and (3) higher stages. It is convenient to refer in the first place to higher agricultural education, some provision for which has been made frequently at an earlier date than for the other stages and which by its fitting into a University system is still, perhaps, best provided for. The University ordinary degree course in agriculture furnishes a grounding in scientific principles in their application to agriculture which is well adapted to the requirements of the man of good general education who has practical farming in view, but tends to be taken advantage of chiefly by those aiming at appointment in the Agricultural Services for whom it may be regarded as the minimum professional training. In the case of specialist appointments the normal qualification is a degree with Honours in the subject concerned.

Agricultural Education at the intermediate stage is represented by the courses of somewhat varying grade provided in the agricultural colleges, most of which award a diploma on the satisfactory completion of the requisite period of study. Most colleges also conduct short practical courses in agricultural subjects and specialised courses in horticulture, dairying, poultry-keeping and other subjects, while some, by affiliation with Universities, prepare students for a University degree. Hitherto, in this country at any rate, there has been an insufficiently clear distinction between the College diploma course and that of the University. They have differed often less in aim and in scope than in entrance qualification and pass standard, and the college course, though professedly catering for those who would afterwards seek their living on the land has tended, alike with the University course, to attract the student whose ambition lay in the direction of an agricultural appointment. In America the agricultural college would appear to have come much nearer to achieving its true purpose. There it is more and more the practice for sons of farmers and others who intend to engage in farming to follow first a college course, and the aggregate attendance at the numerous agricultural colleges amounts every year to many thousands.

To bring the agricultural college course into line with the needs and circumstances of the man who is to engage in farming two principal considerations would seem to require to be kept in view, firstly, that after an already lengthy school education and at an age critical from the point of view of initiation into farm practice, the prospective farmer can spare only a relatively short period for further study; and secondly, that the course itself must be planned on thoroughly practical lines. This last does not imply that undue emphasis is to be placed on manual or practical work. The ordinary farm, rather than the agricultural college, is the proper place

for initiation into farm practice. Assuming a school education up to intermediate standard, an adequate college course should be covered in about two years. While the college course should be thus sharply differentiated from that of the University, much is to be gained by an intimate connection between University and college. The University will benefit by being brought into closer touch with the problems of practical agriculture, while the college will profit by collaboration with workers in cognate fields of science and should otherwise derive valuable stimulus from University association.

Of very distinctly lower standard than the agricultural college but with cognate organisation and object are the farm institute and the farm school of the continental type. The farm institute caters for young people of the country who, from education limitations or for other reasons, are unable to take advantage of an agricultural college course. In addition to less insistence on a satisfactory preliminary education the courses are shorter, being limited as a rule to a period of about six months. Students live in and are expected to take a considerable share in all operations on the farm which is attached to the institute.

The farm school is comparable in scope and in object with the farm institute, but even greater prominence is given to manual work and the course may cover as much as two years.

In recent years, increasing attention has been bestowed on the question of making provision for agricultural education, or at any rate of laying a foundation for such, within the curriculum of the ordinary rural school. One great obstacle to the conveyance of technical information to the agricultural community is the unfamiliarity of the average adult with the most elementary notions of science. To induce an intelligent interest in, and appreciation of, the facts which affect his calling the first steps must be taken at a period when his interests are plastic and when his mind is readily receptive of ideas, that is, in the days of childhood and adolescence. A system of education designed to meet the needs of the country child must fall short unless it has definite aims, firstly, the development of the child's interest in things rural, for where his interest is there will he build up his principal body of knowledge, and secondly the laying of a satisfactory foundation on which he can later establish the superstructure of technical information which is of vital importance to him in his life work.

Nature study constitutes a valuable part of the curriculum in the earlier years of school life, leading up, at about the age of twelve years, to more systematic instruction in what is commonly called rural science. The term itself is somewhat of a misnomer for it is altogether premature to introduce specifically vocational instruction at this stage. A suitable rural science course comprises instruction in the elements of physics, chemistry, and biology, a definite rural bias being given by the employment of illustrative material of agricultural or rural interest. Work in the classroom is accompanied by laboratory exercises, outdoor instruction and experimental work on the school plots, but care should be taken that undue emphasis is not placed on purely manual or practical work. There is considerable scope for correlating, with the science courses, the instruction in other subjects in the curriculum such as arithmetic, geography and handicraft. Where circumstances permit, the rural science course is followed by the continuation class in which definite vocational instruction finds its proper place.

In a general scheme of agricultural education such as that outlined above, while provision may be made for passing from lower to higher stage, each stage may be considered also as serving a distinct category of individual. Thus the pupil who has followed a course in rural science may proceed to

the agricultural college, but if he passes from the elementary school direct to farm work he has received at any rate a training generally useful and adapted to his vocation, and of special value as laying a foundation for whatever technical instruction he may have the opportunity of acquiring later.

Mention also requires to be made of the agricultural instruction of a less systematic character which is undertaken by the extension staffs of agricultural colleges or district officials of agricultural departments. Lectures—either a short series or single lectures on particular subjects—are arranged at suitable centres, field experiments and demonstrations are carried out and there is much individual advisory work. Cognate to this line of instruction is the issue of agricultural bulletins and leaflets and the dissemination of agricultural information by means of the Press.

To discuss the question of agricultural education in relation to the specific circumstances and requirements of India would necessitate a more intimate acquaintance with existing conditions there than can be claimed by the present writer whose connection with the country ceased some eighteen years ago. A few general comments, however, may be made.

It would seem to be somewhat characteristic of the East that in selecting a line of professional study the student is less influenced by a particular interest in the subject concerned than by an estimation of the prospective market value of the qualification to which the study leads and especially its value in securing admission to Government service. Such a statement is, doubtless, far from being universally true, but in a large proportion of cases a man would seem to follow with equal inclination, or lack of inclination, agriculture or law, medicine or engineering. The result is, in so far as that is a correct presentment of the case, that the number of candidates for admission to agricultural colleges will be regulated, in large measure, by the operation of the law of supply and demand in respect of public appointments and also that a considerable proportion of these candidates will have had no previous intimate connection with the land. The agricultural colleges do attract to some extent the sons of substantial landowners but the day would seem to be still distant when any considerable numbers will regard a college training as a desirable or effective equipment for the man who is to engage in practical farming. A comparatively small number of agricultural colleges would suffice, therefore, to meet the effective demand for relatively advanced instruction in agriculture.

One function of the agricultural college is undoubtedly to provide a suitable training for the personnel of the agricultural departments, and for that reason, if for no other, the agricultural colleges should be well staffed and equipped. In the matter of staffing, the Indian colleges formerly left a good deal to be desired. The heads of the more important teaching departments, recruited as a rule from this country, were well trained men, but, with the exception of the Principals, were charged with general departmental duties which left leisure for little beyond a general supervision of the teaching in these institutions. The quality of the indigenous staff was only moderately good. In more recent years, some of the colleges at any rate have secured University affiliation, and this should operate favourably in the raising of standards. For many of the agricultural appointments the training covered by a college diploma course should fairly meet the case, but there will be a considerable proportion of posts for which it is desirable to recruit men with a University qualification. For specialist appointments, the possession of a University Honours degree would be necessary. It is probable that the Indian Universities are not in too favourable a position for providing such specialised training. The alternative would seem to be to send men abroad for training, which is not, in all respects, a satisfactory solution of the problem. Where this procedure is adopted, the men to be so dealt with should be carefully selected.

The method of selection followed in Egypt with satisfactory results, was to pick locally trained men, who, after a period of some two years' service in the Agricultural Department, had given distinct evidence of ability and assiduity. Considerable discrimination must also be exercised in choosing the particular Universities abroad to which men should be sent.

If Egyptian experience can be relied on, the type of institution represented by the farm institute or the farm school is not likely to prove very effective in India. The idea of a training in which special prominence is given to the practical side would appear at first sight to have much to commend it, particularly in a country where book learning is inclined to be more in evidence than practical ability. In Egypt it was found that a substantial number of pupils, usually the children of poorer parents, were perfectly willing to enter the farm schools and to engage in all the practical operations prescribed. On completion of the course, however, not only they, but also the parents, considered it quite impossible for them to take part in any of the manual operations associated with an agricultural vocation. They formed in fact an undesired addition to the number of candidates for posts.

There probably would be more scope for introducing some elements of a rural science course into the curriculum of the elementary school. The main difficulty would lie in finding teachers capable of handling the course in an adequate manner. From this point of view, other things being equal, there would be a decided advantage in teachers in rural areas being drawn from the agricultural classes, but that in itself would not suffice. Teachers would require a very special training for this line of work.

Any attempt to relate agricultural conditions in Egypt to those in India suffers from the serious limitation of the enormous difference in conditions between the two countries. Egypt is a land which, agriculturally, has been greatly favoured by nature. Possessed of an extremely fertile soil, a well assured, controlled and, on the whole, plentiful water supply, a climate which in the summer is warm but is not subject to extremes of heat, and which in winter only rarely touches frost, it grows admirably a very considerable range of summer and winter crops. Conspicuous among these is Egyptian cotton, a crop round which the whole agricultural system may be said to centre, and which, since the practical elimination of the Sea Island type, is not only the world's finest cotton, but which under Egyptian conditions gives a much higher average yield per acre than is obtained in any other cotton-growing area. There are other crops which give a high monetary return, such as sugarcane (replacing cotton in a considerable portion of the southern area), onions, oranges, dates and other fruit and vegetable crops. Another crop worthy of special mention is *berseem* or Egyptian clover, valuable not only as an excellent forage crop but also as playing a prominent part in the maintenance of the soil fertility. Egypt enjoys a comparatively high degree of immunity from diseases and pests affecting either man, beast or crop, and it has a vigorous, active and skilful peasantry. Both the country and the people are homogeneous in character. Broadly, one village is typical of the whole country. Under such conditions, only a wise and orderly administration is wanted to achieve a high degree of prosperity and some idea of agricultural well-being in Egypt may be gleaned from the fact that ordinary good land normally changes hands at anything from £150 to £200 per acre, or pays an annual rental of £10 to £15 per acre.

India is a land of highly varied soil, of drought and of flood, of extremes of climate, of diverse peoples, languages and creeds, of numerous diseases and pests. Altogether, conditions are much harder there, and its agricultural problems are of a much more varied and complex nature than are those of Egypt. Nevertheless, it is possible that some points in Egyptian experience may be of interest to those dealing with Indian problems. Certain subjects are singled out for brief comment in the order in which they occur in the Royal Commission's Questionnaire.

Mr. E. Shearer.

Research.—Egypt did not organise an Agricultural Department until 1911, and during the War period there was a complete check to development. Immediately following the War, there was considerable advance and, altogether, research was organised on a fairly substantial scale. There was, in each department, a nucleus of highly qualified English staff, associated with whom were a specially selected Egyptian staff. The latter were, for the main part, graduates of the Egyptian Higher School of Agriculture, though some few had European degrees. Latterly, a relatively large number of Egyptians were on educational mission in England and America for specialised training with a view to subsequent attachment to the Research Department. In association with Europeans, many of the Egyptian staff were capable of excellent work, though only rarely did they display the initiative and sustained interest which would have made it possible for them to carry out work of any real value unaided. The department in which research gave most promise of immediate results was that of Economic Botany, the staff here consisting of six English Botanists and an Egyptian personnel of some twenty agricultural graduates. The principal crops under investigation were cotton, wheat and maize. The amount of material which accumulates in work connected with plant-breeding and plant selection is very extensive, and if any rapid progress is to be made a relatively large staff is essential. Another large department was that of Entomology, which not only carried out research on crop pests, but had also a numerously staffed organisation for the control of the pests, particularly those affecting cotton and oranges. A substantial amount of definitely fruitful research was also carried out in the Horticultural, Chemical and Veterinary Departments.

Demonstrations and Propaganda.—Field experiments and demonstrations were fairly widely employed, but were taken advantage of by the agricultural community to only a limited extent. The larger cultivators readily lent their lands for such, usually being guaranteed against any loss. Circulars and bulletins were widely distributed, but it is doubtful whether, to any extent, they were read or digested. Cultivators came in considerable numbers to seek advice and were always very ready to try any new crop variety.

Soils.—Reclamation of large areas of alkali land has been successfully carried out in Egypt by drainage and washing, these means being supplemented in more intractable cases by the application of gypsum. The main difficulty in making rapid progress with reclamation is the large quantities of water required, not only in the initial stages, but also when the salt content has been reduced to the point where the only crop which will give a really successful return is rice.

Some of the best land in Egypt has suffered serious deterioration from lack of provision of drainage. Such land rapidly recovers when drainage is introduced.

Fertilisers.—In the last two years there was, in Egypt, a relatively rapid expansion in the use of artificial manures. This was confined almost solely to indigenous manures, particularly nitrate of soda, the consumption of which in recent years would be from 100,000 to 120,000 tons per annum. Wheat was the principal crop to which these nitrogenous manures were applied. Maize, which ordinarily received practically the whole supply of farmyard manure, occasionally also received a nitrogenous fertiliser.

Potash and phosphates seemed to have little effect on Egyptian crops.

Much of the manure was supplied through the agency of the Khedivial Agricultural Society who maintained a high standard of quality. Latterly the Ministry of Agriculture supplied manures to small cultivators on credit, the cost being recovered with the land tax. This facility was largely taken advantage of.

Crops.—Egyptian experience, which also would seem to be borne out by that of India, seems to show that there is a wide field for improvement of indigenous crops by methods of selection, probably also by plant breeding.

The introduction of new crops from abroad is a possible means of improvement, but is beset with considerable difficulty. Crop plants generally do not readily adapt themselves to a new environment, but the adaptability of any particular crop can only be ascertained by trial. Thus, in Egypt, Indian wheats on the whole did well, Australian wheats fairly well, wheats from South Africa were not satisfactory, while wheats from America and Europe were a complete failure. Considerable success in the introduction of new crops has been achieved in the United States of America. In this case, through a well organised plant exploration department, the whole world has been brought under toll and, in the widely divergent conditions existing within America itself, a relatively large number of new crop plants have found a suitable environment.

Distribution of cotton seed was undertaken on a relatively large scale by the Egyptian Ministry of Agriculture, through the same organisation and on the same terms as in the case of manures. Wheat seed was similarly dealt with to a much more limited extent.

Crop Protection, Internal and External.—There existed in Egypt an organisation for dealing with crop quarantine, both external and internal. It is a little difficult to judge of its value, but one is inclined to believe that it did not achieve very much.

Implements.—Comparatively little progress has been made in Egypt in respect of the introduction of improved implements. On large estates, steam tackle cultivators were fairly common. Tractors, introduced in great numbers after the War, soon disappeared. Over the greater part of the country the primitive implements of tillage persist, and on the whole achieve their purpose very satisfactorily. For water lifting, engine-driven pumps are widely used in the larger installations. In dealing with smaller areas the ancient water lifts of the country, some of them slightly improved, continue to be employed.

Veterinary.—Egyptian experience would indicate the desirability of the Civil Veterinary Department being under the Director of Agriculture.

In Egypt there is legislation covering the control of contagious diseases, the administration of which in practice works quite smoothly.

There was no great demand for preventive inoculation except in the course of a widespread outbreak of disease, when the demand became so general as to be difficult to cope with.

Animal Husbandry.—On the question of live stock improvement generally, the same remarks apply as in the case of crop improvement. There is a wide field for improvement of stock by judicious selection, and much more is likely to be achieved by this method than by bringing in animals from abroad.

Oral Evidence.

54,005. *The Chairman*: Mr. Shearer, you are Professor of Agriculture at the University of Edinburgh, and Principal of the Edinburgh and East of Scotland College of Agriculture?—Yes.

54,006. I think you have had some experience in India, and you have also had a period of service in Egypt?—Yes.

54,007. Will you tell the Commission, quite shortly, what your Indian and Egyptian service was?—I went out to India in 1904. I was Imperial Agriculturist, rather a high sounding title, but it did not amount to very much. I really occupied the post of Agronomist at the Research Institute at Pusa, which was then just at its beginning.

54,008. *Sir James McKenna*: I think they called you the Imperial Agri-horticulturist in the old days, did they not?—That was the first title at the very beginning. I occupied the post of Imperial Agriculturist for the greater part of my service there. Right at the end of my time I was Assistant Inspector-General of Agriculture. I left India in 1909 and went to Egypt shortly afterwards, and I remained in Egypt until 1924. My first position in Egypt was that of Principal of the Agricultural College at Gizeh, the Higher School of Agriculture in Egypt. Latterly, I was Director-General of the Technical Services in the Ministry of Agriculture.

54,009. *The Chairman*: You have provided us with a note of the evidence which you wish to give. Would you like to add to it at this stage?—There is one point in the comparison between Egyptian conditions and those in India to which I did not specifically refer in my note, and that was the question of agricultural credit. That did not come into my direct purview, but I know a little about the conditions with regard to agricultural credit in Egypt in a general kind of way, so that if the Commission want to have any information on the point I shall be very glad to do my best to give it to them.

54,010. I think that information will be valuable. In the first place, would you compare the moneylender in Egypt with the moneylender in India?—The moneylender in Egypt is not usually a native of the country. In Egypt one gets rather a concentration of a considerable variety of people from the Levant-Greeks, Syrians, Armenians and Jews. These constitute the money-lending classes in Egypt.

54,011. Are they, as a rule, town dwellers or dwellers in the villages?—They generally live in the villages. A Greek, for instance, comes to Egypt and starts a little grocer's business in the village. Then he begins to advance money to the people round about him on the security of their land.

34,012. Is he a shopkeeper?—He is generally a shopkeeper. A great deal of the actual moneylending in the place is done by Greeks and Syrians. The Commission is probably aware of the existence of the Agricultural Bank in Egypt. That was instituted by Lord Cromer, particularly in the interests of the small cultivator. The bigger cultivators are fairly well provided for by various mortgage banks.

54,013. Is the function of that bank the provision of long term credit?—Yes. Twenty years was the sort of normal period envisaged, and the credit was given on the security of the land. The land there possesses a very high value. The Agricultural Bank were prepared to advance up to as much as £50 an acre on land. That was largely taken advantage of, particularly by these very small cultivators. In Lord Kitchener's time there was passed a measure usually known as the Five-Feddan Law, which made it impossible to expropriate any holding smaller than five feddans for a debt. That practically killed the Agricultural Bank, because having no longer any security on their loans they were not prepared to advance the money. The measure was passed really as a safeguard against the moneylender, but it hit the Bank extremely hard. It was not retrospective in its effect, so that all the business that had been done prior to the enactment of the measure was on a regular footing; but practically no new business was taken up.

54,014. What was the effect of the passing of the Five-Feddan Law on the credit of the cultivator?—It really threw the smaller cultivators into the hands of the moneylenders again.

54,015. Loans without mortgage security?—Loans without mortgage security; but probably the moneylender had ways and means of getting at these people, irrespective of that.

54,016. Were the loans secured on the crop?—They might have been, or on the cattle.

54,017. Is the Egyptian cultivator as anxious to honour his bond as the Indian cultivator appears to be?—He is never in a great hurry to pay up if

he can avoid doing so; but, on the whole, I think he pays up fairly well. He put off the evil day as long as he can.

54,018. Has he the same horror of repudiation?—I think he has.

54,019. Would you agree that the Indian cultivator is distinguished for his disinclination to repudiate a debt?—That hardly came within my experience. I would rather not speak as to that.

54,020. Now that we know the whole history of the Agricultural Bank, would you agree that the story is a warning as to the danger of providing small cultivators with easy credit until they have been sufficiently well educated to grasp the meaning of credit and to make good use of their credit?—I do not think so. I think the Agricultural Bank served a very useful function in Egyptian agriculture. A man resorted to the bank for various reasons. Very frequently a man borrowed because he was in debt to somebody, or he probably wanted to get rid of a pressing creditor in place of one who was not quite so pressing. A man also borrowed on account of the extraordinary expenses which came on him from time to time,, such as when a marriage took place in the family, and that kind of thing. That sort of thing always involved very heavy expenses. Then a man also borrowed quite frequently when he wanted to get a piece of new land in order to increase his holding. It was a very useful form of credit in that direction. It enabled a man to enlarge the scope of his operations.

54,021. But before the passing of the Five-Feddan Law, and the consequent restricting of the business of the Agricultural Bank, the cultivator depended for short term credit on the moneylender and not on the Bank, did he not?—That is so.

54,022. So that the position as regards the short term credit was hardly affected?—There was a certain amount of short term business done by the Bank. In addition to loans on the security of land, in certain cases loans were made on note of hand, short term loans. These loans would be made where the credit of the borrower was pretty good and where he was well known to the Agricultural Bank's agents. The Agricultural Bank, naturally, had its agents all through the country, and they got to know the people pretty well.

54,023. Is it your personal opinion that the disadvantages the consequence of the Five-Feddan Law outweigh the advantages?—Yes.

54,024. Does that law still operate?—Yes. I may add that at the moment there is one of the officials of the Agricultural Bank on leave in this country, and I have no doubt that if the Commission wanted to get further information on the matter that gentleman would be only too pleased to give it.

54,025. Is it your experience that the moneylender in Egypt is, as a rule, rule, less inclined to foreclose and take over the land where a mortgage exists, than is his brother in India?—There again, my experience in that direction in India did not go very far.

54,026. You do not feel inclined to compare the conditions in the two countries?—No.

54,027. As to Egypt alone, was the foreclosing by the moneylender, and the taking over of land where a mortgage existed, a common experience?—Fairly common.

54,028. Is there in Egypt any system of Government advances, such as the system known in India as *taccavi*?—No. They do not exist in Egypt.

54,029. No loans by Government?—No, no loans by Government. Occasionally, in times of stress, particularly in latter years, the Government intervened and bought up part of the cotton crop, for example. That was in essence a form of Government advance, but beyond that they did not go.

54,030. Was that in an attempt to stabilise the market?—Yes. When prices were low, instead of having to throw all their cotton on to the market to meet pressing obligations, the Government bought up a certain amount at a fixed price.

54,031. You compare the agricultural environment in Egypt with that in India, and you point out that Egypt enjoys many advantages?—Yes. It is naturally a fairly prosperous country.

54,032. What do you say as to the comparative skill of the cultivators in the two countries, broadly speaking?—I should say that in India one got a very much wider range of variation in skill. In some parts of the country one finds extraordinarily good cultivators. In other parts they are pretty primitive. In Egypt the general level is pretty high, though perhaps not quite so high as the best in India, but reasonably good everywhere. Cultivation is rather a simpler proposition in Egypt altogether. For instance, the water supply is assured. The actual routine of cultivation has tended to become a kind of standard process.

54,033. What is regarded, in Egypt, as the minimum area of good agricultural land, under irrigation, which would provide bare subsistence for a man, his wife and three children—the average family?—Under ordinary agricultural crops, I think a man would get along perhaps with as little as one feddan, that is one acre.

54,034. That was the figure which was mentioned to me in Egypt. So productive is the land that a man can live on one acre?—Yes.

54,035. You are not referring to cotton?—The cotton would be bringing in a considerable part of his returns.

54,036. *Professor Gangulee*: You mean he would grow other crops, besides cotton, on this one acre?—Yes. In the summer months the man would have half of his area, probably, under cotton and half under maize. In the winter months he would divide it between wheat, clover, beans and the like.

54,037. *The Chairman*: Would such a man actually buy a considerable part of the food which he and his family eat?—They usually grow their own food supply. Maize is the staple cereal there, and that is almost universally grown.

54,038. How many crops would he take off his acre in the year?—Two, normally.

54,039. And in some cases three, where foodstuffs are concerned?—It is rather difficult to get more than two, except in the case of vegetable crops. About the middle of July the whole country is under either cotton or maize, with some portions in the north devoted to rice and with some parts in the south devoted to millet replacing the maize.

54,040. *Professor Gangulee*: He grows enough maize out of his one acre to feed his whole family, does he?—That is what he aims at, yes, supplemented by wheat or barley in the winter months.

54,041. *The Chairman*: I think six million acres is the total area which is capable of being irrigated, is it not?—Actually between five and six million acres are now under irrigation, and there is probably another two and a half million acres that could be brought in.

54,042. Is there any dry farming?—There is some slight attempt at dry farming in the *Mariout* region, extending from Alexandria west towards Tripoli, but it does not really amount to very much.

54,043. Is there an important population existing on dry farming?—A Bedouin population. The only crop they attempt to grow is barley, and they get a very poor return indeed.

54,044. Does the Agricultural Department concern itself at all with dry farming?—In that region, slightly, particularly in the direction of trying to take up fruit cultivation.

54,045. Do they practise any methods of tillage designed to conserve moisture in the soil?—No, nothing very definite. Water is pretty plentiful as a rule, and they do not seem to think that their labour is really justified in trying to conserve moisture.

54,046. Under the heading of "Demonstration and Propaganda," on page 237 of your note, you compare the agricultural conditions in the two countries. You say, "The larger cultivators readily lend their lands for experimental purposes, usually being guaranteed against any loss." Do

you remember payments being made on account of loss incurred?—Yes, I do.

54,047. Was it difficult to assess the loss?—Not particularly. For example, if a cultivator was growing one particular variety of cotton on his farm, and some new varieties were suggested to him for trial as an experiment or demonstration not only for himself but for his district, the standard yield would be taken as that which was given by his own cotton crop on the rest of his farm, and if the portion under experiment yielded less than that, it was made up by an equivalent amount. That could quite easily happen, because you do get pretty wide variations in the yield of different varieties of cotton.

54,048. Were these experiments carried on entirely by the cultivator, or under the close surveillance of the department?—They were carried on under the surveillance of the department.

54,049. With departmental labour to assist the cultivator?—No. The cultivator provided the labour, but the experimental operations at every stage were supervised by the agricultural staff.

54,050. Under the same heading, on page 237, you say, "Cultivators came in considerable numbers to seek advice and were always very ready to try any new crop variety." Can you make a fair comparison between the Indian cultivator and the Egyptian cultivator in that respect?—I do not think I can very fairly make that comparison. I did not have the advantage of a great deal of district work while I was in India, and I did not personally know to what extent cultivators did consult the district officers.

54,051. It is worth pointing out that communications in the Delta are extremely good as compared with India?—Yes.

54,052. Is that a very important consideration?—Yes, it is.

54,053. *Professor Gangulee*: Apart from the factor of communication, can you tell the Commission what was the secret of this readiness on the part of the Egyptian cultivator to accept the suggestion of the Department of Agriculture? Was there any particular factor at work?—The personal factor came in very much. A good deal depended on the Agricultural Officer, and once he had established confidence in his district it seemed to be natural for the cultivators to come to him and consult with him.

54,054. *The Chairman*: Under the heading "Soils," on the same page, you talk about the recovery of land from alkali conditions by the application of gypsum and a large quantity of water, and drainage. Had you anything in Egypt in the way of systematic and sustained research on the problems of irrigation as touching agriculture generally and the soil in particular?—Yes, the Ministry of Agriculture itself, particularly in the latter years of my stay there, engaged in research on this particular point. The Ministry of Agriculture was also in pretty close touch with the State Domain's Administration, which had large areas under reclamation. This was more a matter of routine assistance, of doing estimations of salt content in the water at different stages of irrigation. A certain amount of fundamental work was done by the Chemical Department in the Ministry of Agriculture.

34,055. Take the problem of the precise amount of water required to grow a particular crop, and its distribution through the growing period: was that under investigation?—That was under investigation also.

54,056. By the Agricultural Department?—By the Agricultural Department, and also by the State Domain's Administration. They had, at various points, *Venturi* meters established where they measured the amount of water which was applied to each particular crop.

54,057. Is water paid for on the acreage basis?—The water rate is included in the land tax.

54,058. Is it varied according to the crop grown?—Yes.

54,059. It is a fixed assessment?—Yes, according to the value of the land itself.

54,060. Is irrigation by wells common in Egypt?—The ordinary canal supply is frequently supplemented by irrigation from wells.

54,061. I mean irrigation by lift from wells?—The ordinary canal irrigation is very frequently supplemented by water drawn from semi-artesian bores. Usually, a steam engine or an oil engine is installed and fairly large quantities of water are raised; but the well, in the sense of the ordinary well, does not exist.

54,062. I have myself seen, in Egypt, irrigation from wells by means of the ordinary wheel lift driven by cattle power?—I think that is just a receptacle for collecting the water from an adjacent canal or stream.

54,063. Not in every case, I think. Was any investigation being prosecuted into that problem, lift and mechanical lift?—No.

54,064. Were tube wells in existence when you were in Egypt?—Yes.

54,065. Deep tube wells?—Yes.

54,066. At what sort of depth was water being found?—I would be rather afraid to give any exact figure, but, speaking roughly, I should say it was not necessary to go down more than 100 feet.

54,067. Was the department concerned to work out the economics of the tube well?—Not at all. That was entirely a matter for private enterprise. There was a great number of these tube wells scattered up and down the country.

54,068. On page 238 of your note, you suggest that Egyptian experience indicates the desirability of the Civil Veterinary Department in India being under the Director of Agriculture. How does Egyptian experience suggest that?—The Veterinary Department in the Ministry of Agriculture was in point of fact under the Ministry of Agriculture, and, personally, I do not think things would have worked very satisfactorily in any other way. It is not only that there are questions of general veterinary policy which must be determined by a knowledge of all the agricultural conditions concerned, but there are questions of immediate policy which arise from time to time and which the veterinarian himself is not competent to take up and decide upon. I think the last word must lie with the Agricultural Department; for instance, the closing down of markets.

54,069. Is there any private veterinary practice in Egypt?—There is a little in the towns of Cairo and Alexandria. Apart from those towns, there is practically no private practice.

54,070. What is the highest post open to the Veterinary Service?—Director of the Veterinary Service in the Ministry of Agriculture.

54,071. Such a post as Director of Agriculture would not be open to him?—No.

54,072. Or Deputy Director of Agriculture? How does the salary of the chief Veterinary Officer compare with that of the Deputy-Directors of Agriculture?—It is considerably higher.

54,073. But not as high as that of the Director of Agriculture?—There was not any post of Director of Agriculture. The man who definitely controlled the Agricultural Department was the Under-Secretary of State to the Ministry. The post of Director of Veterinary Service would come in the scale not immediately below that, but very close approximating to that scale. The actual scale, I think, was one of £1,200 to £1,500 per annum, plus 25 per cent. expatriation allowance in the case of a European.

54,074. That is a problem attaching to the placing of the Veterinary Service in a position subordinate, as it were, to the Agricultural Service, that you cannot, in the nature of things, presume to offer to the Veterinary Service quite the same prospects of preferment that you do to the Agricultural Service?—That is so.

54,075. You refer, under the same heading on page 238, to a demand for preventive inoculation against disease. What disease was that?—Rinderpest.

54,076. You say that immunisation by inoculation was practised. What class of inoculation was that?—The double method.

54,077. Was that given on a large scale?—On quite a large scale.

54,078. Was it successful?—Absolutely. If it was done while the animal was still growing, only a very temporary immunisation was conferred, but if it was done at any time after two years of age we had a lot of information to show that it was absolutely successful.

54,079. Was the practice which this particular method involves, namely, of laying up the beast for a period of time, a practical difficulty?—Not at all. One chose ones season when the inoculation was going to be done.

54,080. You mean in the slack season, but the epidemic chose that season. You had to inoculate in face of this emergency?—Quite.

54,081. You give us some information under the heading of "Animal Husbandry." The Commission would like to hear, in some detail, what the practice in Egypt is in the matter of fodder supply. Is it by fodder crops grown on irrigated land?—In the winter months there is no difficulty whatsoever. There is a large quantity of Egyptian clover grown. That is part of the regular rotation of the country. There is usually ample forage for cattle during the winter months. In some parts of the country it is quite impossible to eat all the clover. When it comes to the summer months, from about the middle of June until about the end of November, there is a period when the cattle are on comparatively short commons. During that period they have to subsist mainly on dry fodder, particularly wheat and barley straw. The wheat and barley straw is supplemented, in the case of working animals, by a ration of beans, i.e., bean grain. Directly the maize cultivation begins in the latter part of July, there are a good many maize thinnings available.

54,082. Has any attempt been made to preserve the surplus of grain fodder in the shape of hay or silage?—There is a certain amount of hay made from clover, usually known as *dreiss*, but the cultivator has got rather a curious prejudice against this hay.

54,083. What is the nature of his prejudice?—He thinks his cattle get rather slow and lazy on it. Perhaps they do to a slight extent, but it is certainly an excellent, nutritious fodder. A slight amount of work was done in the direction of making ensilage, particularly on the State Domain's Administration, also from this Egyptian clover. That was a method which was not open to the small cultivator, because the shrinkage was such in the making of silage, in small quantities, from clover that unless one had a fairly big area to put into one's stack it was not worth while. It wanted something like 50 acres to make a stack that was worth while.

54,084. How was the silage made? Was it made in pits or merely stacked?—It was merely stacked.

54,085. With any air-tight closing material?—Not at all. It settled down under its own weight, and it settled down very rapidly. There was very large shrinkage and great drainage of moisture from the bottom.

54,086. Would you agree that that is a thoroughly unsound method of making silage?—I do not know that I would. There was a certain amount of waste round the exterior of the stack, but provided the stack was a big one, the proportion of waste to sound stuff was not a very high one. When one got down to the small stack, the method became quite impracticable.

54,087. How about the habits of the cultivator in the matter of feeding the cow in Egypt? Is she fed reasonably well?—Yes. In the case of the small cultivator, the cow is not only a breeder of animals but is also a draught animal. She is reasonably well fed, just as the bullock would be well fed. As a rule, she is not at all a heavy milker, so there is no great strain on her from the milk point of view.

54,088. Is any special care taken of the cow during pregnancy?—No, I do not think so, nothing special.

54,089. Is the calf allowed to suckle?—The calf must always be present at milking time. It suckles the cow to start with, and then the milking is done, and the calf finishes off again; so that the calf always gets part of the milk supply direct.

54,090. And has the advantage of seeing the rest taken away?—Yes.

54,091. Does the cultivator and his family consume milk and milk products?—They consume cheese products to a considerable extent.

54,092. And fresh milk?—Not very largely.

54,093. But the diet of the average Egyptian family is reasonably varied, is it not?—It is reasonably varied and reasonably nutritious. Cheese, eggs and beans are highly nutritious, and those are regular articles of diet for them.

54,094. Is any sustained effort being made to improve the breed of cattle? —Yes. From quite a considerable time back a certain amount of work on the improvement of cattle was undertaken by the Khedivial Agricultural Society, which was modelled on the Royal Agricultural Society of this country. They carried out operations for a considerable number of years, not, I think, with a great deal of success because they got right off the line at the beginning by importing foreign blood. They did not go very far to get it. They went to Syria to get stock for improvement, and a good many years were spent on this line without very much result. When the Ministry of Agriculture got going, two lines of improvement were taken up. One was the improvement of the ordinary type of work animal, and the other was an attempt to select a really good milch type. On both these lines substantial progress has been made. It is work, of course, that takes a very long time to show very much effect, but I am confident that, in time, very good results would have been achieved in that direction.

54,095. Was the distribution of water efficient in Egypt, in your experience?—It was.

54,096. Do you think we could usefully discuss the marketing arrangements in Egypt? Are you familiar in detail with them?—In a general way. Markets were controlled by the Markets Company in Egypt, which had a concession with regard to the establishment of markets in convenient centres all over Egypt.

54,097. A monopoly or a concession?—A concession, I believe. I would not be too positive of that; but they provided sites and people brought their cattle and other produce there to sell. The people paid a toll for entry to the market, and then the actual marketing was conducted within the market by private bargaining.

54,098. Were cultivators represented on the body controlling the markets? —No, I do not think they were at all.

54,099. Did the marketing appear to you to be efficient and orderly?— It was a pretty haphazard arrangement altogether.

54,100. Was the produce reasonably well put up, packed or baled as the case might be, by the cultivators?—Cotton must be excluded from all I have said. Cotton was marketed under totally different conditions.

54,101. But in marketing, again, there was good communication all through the Delta tract?—Yes. That facilitated the matter very much.

54,102. It is the key to the marketing situation, is it not?—That is so. Usually, in most centres there was a market once a week, so that people had frequent and good opportunities of disposing of their produce.

54,103. Did the average cultivator in Egypt appear to you to have the financial resources required to hold up his crop for better prices, or was the market flooded when the crop was ripe?—As a rule he could not hold up indefinitely. He could hold up his cotton crop for one or two months, but if it was a matter of holding it up for four or five months beyond.

the time it was due for marketing, then he experienced difficulty. Often. at the beginning of the season, one found a great slowness in placing the cotton on the market, if prices were not promising to be very favourable.

54,104. Is there borrowing for the definite purpose of marketing; that is to say, of holding the cotton?—Sometimes there is. Sometimes cotton will be lodged in the stores of the banks, for example, and the banks will advance so much money on every bale of cotton.

54,105. The cultivator will decide when the cotton is actually to be sold? —Yes.

54,106. Is that encouraged as tending to prevent the flooding of the market at flush seasons?—It is not definitely encouraged, but it is pretty generally done. It is a business which the banks regard as part of their general routine operations.

54,107. Is the co-operative movement active in Egypt?—No. That is not developed at all. Within the last two or three years there has been a Co-operative Section of the Ministry of Agriculture, but actually I think the activities have amounted to practically nothing.

54,108. *Professor Gangulee*: When the cultivator puts his crop into the stores of the banks, and the banks allow credit on those stored crops, is the crop in the charge of the bank or in the charge of the farmer himself? —In the case of cotton, it is usually lodged in the charge of the bank.

54,109. The cultivator has to deliver his crop to the bank's storage?— Yes.

54,110. *The Chairman*: What is the law of succession in Egypt, primogeniture?—Yes.*

54,111. So that the holdings are not split up on succession?—In the case of a large estate I think the primogeniture will probably hold, but in smaller holdings, where there is no specific attempt to preserve the prestige of the family, you would get splitting up.

54,112. Do you have the problem of fragmentation in Egypt?—Yes.

54,113. To the point of interference with agricultural practice?—In some of the more closely settled parts it is rather a problem, for instance, in a region like Menufia, where there is an agricultural population of something like 1,600 to the square mile. The ownership is often reduced to very small dimensions.

54,114. Has any attempt been made to consolidate holdings?—No. The cultivators themselves try to avoid it as far as possible.

54,115. They realise its disadvantages?—They realise its disadvantages.

54,116. The problem is very different in Egypt, because, as a rule, you have land all of the same quality?—Yes.

54,117. While there may be sub-division, there is not the same demand for each small plot to be divided? Is that the position?—That is so.

54,118. So that fragmentation, properly so-called, does not exist to the same degree?—No. It is not the same problem in Egypt as it is in India.

54,119. Did you form the view that fragmentation was increasing?—It does rather tend to increase as the population increases.

54,120. And there has been a very considerable increase in the population in the last half century?—Yes, in the last 30 years particularly

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* *Note by witness.*—On further consideration I would say definitely that the law of primogeniture does not operate in Egypt. Sons inherit equal shares—daughters smaller shares, but to preserve family prestige, the estate frequently is not divided up but is administered either by one member of the family, usually the eldest son, or it may be administered by trustees definitely named for this purpose. In the latter case the estate becomes what is called a "*Wakf.*"

There is the same difficulty there that there is in India, namely, that of moving the people from one part of the country to another. Cultivators are very reluctant not only to move from one Province to another Province but to remove from one village to the next village.

54,121. Are there many large landholders in Egypt who cultivate their own land?—Quite a fair proportion.

54,122. Has the introduction of sugar increased the practice of landholders farming their own land?—There are one or two company enterprises which undertake the cultivation of sugar, but for ordinary crop farming there is quite a large number of really big cultivating owners.

54,123. *Sir Ganga Ram*: Is it beet sugar or cane sugar?—Cane sugar. We have, in Egypt, millionaire farmers.

54,124. *The Chairman*: They are actually farming, the labour being done by men on day wage?—Yes, but the man himself actually supervises at every stage.

54,125. Is there any reluctance, on the ground of social prestige, to take a personal part in the operations of a farm?—It depends on the kind of education the man has had. The man who has been brought up on the land does not regard it as derogatory to his dignity to take part in agriculture. A man who has been sent to school or to college and comes back again has got very much less taste for engaging in that kind of work, although I do not think he would lose any social prestige if he did engage in it. I saw a good many examples of sons of substantial landowners (who themselves had taken a great interest in their estates) letting things go to pieces pretty badly.

54,126. Seasons of severe dearth are not often met with in Egypt, are they?—No. The cotton crop really dominates everything there. It is more a question of cotton prices than anything else which determines the agricultural well-being of any particular season.

54,127. Crop failure, leading to actual physical want, is hardly known, is it?—No.

54,128. Would you say that the standard of living and the amenities of an agricultural village in Egypt are higher than in a village of the kind in India?—The standard of living is certainly decidedly higher. I do not think the amenities are substantially better.

54,129. The houses are very much better, are they not?—They are not particularly better I think. Perhaps they are a little more substantially built.

54,130. Are sanitary practices conspicuous by their absence?—They are.

54,131. What about epidemic disease?—Epidemic disease is not nearly so rife in Egypt. The country does not seem to lend itself to it. It is not so much the cleanly habits of the people as that the country does not seem to lend itself to it.

54,132. Is anyone concerned to try to improve the amenities of rural life in Egypt?—There is a Public Health Service which is pretty active. They have their personnel all over the country, but I do not know whether they count for a great deal in actual village life.

54,133. Has anything in the nature of a comprehensive economic survey of individual cultivators' budgets, or of village budgets, been carried out in Egypt?—I am not aware of anything of that sort. Many of the large estates keep regular books, and their operations are open for inspection.

54,134. In your second note of evidence, you give what you regard as an ideal system of education in an agricultural country?—Yes.

54,135. That is by no means a picture of the existing conditions in Europe, it it?—It is not.

54,136. On page 233 you say: "In America the agricultural college would appear to have come much nearer to achieving its true purpose. There it is more and more the practice for sons of farmers, and others who intend

to engage in farming, to follow first a college course, and the aggregate attendance at the numerous agricultural colleges amounts every year to many thousands "—that is to say, a college course before a degree course at an agricultural college?—Those people would normally attend an agricultural college which was part of the university organisation, and it might lead to a definite university degree.

54,137. Why do you say "follow first a college course"?—I mean prior to engaging in active farming.

54,138. These are colleges affiliated to universities?—Yes.

54,139. Egypt has not solved the problem of how to educate a rural population without causing it to drift towards the towns, has she?—Not at all; far from it.

54,140. Are there two schools in Egypt now?—There are really four. There is one Higher College of Agriculture and there are three of the intermediate type—one at a place called Mushtohr; one at Damanhour and one at Shebin-el-Kom.

54,141. *Professor Gangulee*: Are these called farm schools?—Those are intermediate schools. There was a number of farm schools, but they were closed down.

54,142. *The Chairman*: There is not the slightest sign, is there, in Egypt that boys educated at these schools are inclined to go back to their parents' holdings and work?—I would not say that absolutely. There are a few who go back.

54,143. It is known?—Yes. Some of them have gone back and done well, but they are a comparatively small proportion of the whole.

54,144. What impression did you form of the value of the technical teaching at these institutions? Was it well done?—At the Higher School of Agriculture at Gizeh it was well done. At these other intermediate schools of agriculture I am afraid I cannot claim that it was well done. The staff were very indifferently trained. The schools were organised rather in a hurry before the staff were ready to be engaged for them; and compared with service in the Ministry of Agriculture, the service in teaching in these schools was not very popular, so one was inclined to be left with rather the dregs of the agricultural graduates for the staffing of these schools.

54,145. Do you see many Indian students at Edinburgh University?—Quite a number. We have a few at present in the Agricultural Department of the University.

54,146. What do you say about their previous training?—Generally we find that we cannot assume very much in the way of previous training before they come to us; that is to say, it is rather dangerous as a general rule to grant much in the way of exemptions from the full degree course; but there are exceptions to that. Now and again a man comes to us with a good science degree from one of the Universities, and obviously, there, it is not necessary that he should repeat his whole science course from the beginning. As a rule it is wiser to start him right at the beginning and carry out the full course.

54,147. *Professor Gangulee*: Do you hold any entrance examination before you allow a student to come to the University?—Yes. There is a general entrance examination applicable to all the Scottish Universities, regulated by a special Entrance Board.

54,148. *The Chairman*: What view have you formed of the standard of teaching in pure science at the Indian Universities as compared with that in our own Universities?—I have no personal knowledge of the Indian Universities.

54,149. Judging by the students who come with science degrees?—Judging by the students, I imagine they cannot have the same opportunities or organisation for teaching pure science.

Mr. E. Shearer.

54,150. Are they weak in any particular subject or direction?—I could not single out any particular subject.

54,151. It has been suggested by some witnesses that opportunities of work in the laboratory and at the bench, and so on, are not, in India, what they might be?—No.

54,152. I do not know whether your experience confirms that?—It would rather tend to confirm it. They are certainly weak in laboratory practice generally.

54,153. *Sir Ganga Ram*: Is the law of succession to property in Egypt governed by Mahommedan law or by local law?—In the case of the Mahommedan population, which represents about nine-tenths of the whole population, it would be regulated by Mahommedan law.

54,154. And the land as well?—The land as well, I imagine.

54,155. Then one acre would not go far between one family?—Quite so.

54,156. You have said that the produce of one acre will support a family. What is the gross produce of one acre in money?—Half that area would be devoted to cotton. One used to calculate it, roughly, as a return of about £40 per acre. Therefore half an acre under the cotton crop would bring in £20. Then half would be under maize in the summer months, and the return would be something like 80 to 100 bushels per acre. The actual money value would be somewhere about £6 to £8 for the half acre. Then the wheat crop, again, would give a return of about £6 to £8.

54,157. What is the average land tax?—The maximum land tax, if I remember right, was a little under £2 per acre. That was for first-class land. For lowest quality land it might be down to 12s. or 15s. an acre.

54,158. I think that Egypt exports £5,000,000 worth of vegetables, does it not?—I was not aware of that large export of vegetables. There is a considerable supply of vegetables to ships at the ports of Alexandria and Port Said; but, apart from that, I do not think there is much export of vegetables.

54,159. According to my information, Egypt exports £5,000,000 worth of cereals and vegetables. Do you export cereals?—Beans would be the chief cereal exported.

54,160. £5,000,000 worth of vegetables and cereals exported is a large amount?—Yes.

54,161. Then I see Egypt exports £56,000,000 worth of textiles. Is that hand-produced textiles, or machine production?—It is almost entirely raw cotton.

54,162. Cotton is separately shown. The £56,000,000 is represented by textiles and yarn?—There is only one cotton mill in the country, and that deals with a very small volume of manufacture.

54,163. Then that means that there is an immense amount of textiles produced by hand?—No.

54,164. How much water per 100 acres is given in Egypt generally?—My recollection is that, in the case of the cotton crop, the consumption was equivalent to about 40 inches per annum.

54,165. They do not give water according to the nature of the crop, but according to the extent of the land?—Yes, that is right. But actually the nature of the crop is important. Thus summer crops like cotton and maize require much more water than winter crops like wheat and beans. Rice can only be grown in considerable quantity in really good flood years, and farmers are advised beforehand how much rice they may grow and corresponding quantities of water are arranged to be supplied. Again, no water is supplied for maize till about the middle of July, the bulk of the water being required for the cotton crop, until the flood season arrives.

54,166. Supposing there was 100 acres, what would they give?—I am not prepared to give a figure for that now, but I could get the figure for the Commission if they desired.

54,167. There is a good deal of poultry-keeping in Egypt, is there not? The peasants derive a very good profit from the keeping of poultry?—Yes. They make sure they incur no loss, by giving the poultry no food. The fowls have to forage for themselves absolutely.

54,168. *Professor Gangulee*: But there is no export of poultry products from Egypt, is there?—Yes, mostly eggs.

54,169. *Sir Ganga Ram*: When you said that dry farming is also done in Egypt, do you mean deep ploughing, or special seeding for the dry crops?—The ploughing is not very deep. Probably it was not quite right to say that "dry farming" was practised. It was rather farming under dry conditions.

54,170. Are there any hydro-electric works in Egypt?—No.

54,171. Are there not plenty of falls in the canals?—No. There are falls at the barrage, but they are not made use of in that kind of way. In point of fact, there was a big scheme at one time in connection with the waterfall at the Assouan Dam, but part of the difficulty was the question of fuel for the burning of the limestone.

54,172. *Sir Thomas Middleton*: In giving us figures of Egyptian crops, you stopped short at wheat. What is the yield of wheat?—It is anything from thirty to about fifty-five bushels. Fifty-five bushels would be considered a very good crop.

54,173. Does the crop suffer from rust?—To some considerable extent. There are two types of rust which they get. The one type affects more particularly the native wheats, and the other type more readily attacks what is known as the Hindi wheat, which originally came from India. It seldom happens that we get the two types of rust operating severely in the same year; if the native wheat is affected the Hindi wheat largely escapes, and *vice versa*.

54,174. With such a dense population depending on wheat and maize, one would suppose that there must be frequent years of shortage?—Rust is never as devastating there as it is in some countries. It causes some loss and damage, but never anything like a complete failure of the crop.

54,175. So far, maize is a safe crop?—Yes, and it is a very highly manured crop.

54,176. You told us that on the whole you thought the Five-Feddan Law was a disadvantage?—Yes.

54,177. I want to follow that up; is it because you think the agents of the banks were quickly getting to know the people better, and would have been able to protect the banks' interests, and also to serve the community in the absence of the Five-Feddon Law?—I am not sure that I follow your point.

54,178. The point is this. The Five-Feddan Law destroyed the mortgage security of the banks and led to a great reduction in the banks' business. That happened at a period when the banks were apparently training local agents, who were getting to know the cultivating population. I want to ask you whether you think it was the interruption of that system which the banks were building up which was the disadvantage?—The banks' system was not actually in the process of being built up. It had been well established for quite a long time, and was working well.

54,179. Was the agent's knowledge of the people increasing rapidly?—Probably it was, yes. The banks probably had been working for the greater part of 25 years.

54,180. If the agents had got such a close local knowledge, how was it that, when the banks' mortgage business was shut down by the Five-Feddan Law, they did not attempt to develop credit on the security of moveables, on which the moneylender now subsists?—They had been organised simply to deal with mortgage, and anything other than that I do not think they felt inclined to touch.

54,181. I think you were responsible for the reclamation of Pusa, were you not?—I was.

54,182. You were in actual charge?—Yes.

54,183. What impression did you get of Pusa as a place for experimental work?—First of all, the situation was not an ideal one for serving the whole of India, in my opinion. It was under conditions which were not altogether too representative of India. Geographically, it was not particularly well situated to serve India. Then the farm itself was of an extraordinarily varied character in the composition of the fields. In the preliminary test work which I did in selecting fields for a series of permanent experiments, I found the most extraordinary variations in yield all over the farm.

54,184. We saw these permanent experiments last winter, and the crops were extraordinarily uniform. It looked as if it were a uniform tract of land. Something has happened to make it uniform?—It is difficult to judge by the eye. I do not know how it actually worked out in yields, but I know that, for two seasons at least in succession, before selecting these fields I weighed the produce of every acre, and I got most extraordinary variations on land which looked reasonably uniform. The land we did eventually select was the most uniform we could find.

54,185. It certainly now does look uniform, or the crop does. When you were in the process of selecting, was it the harvest or was it the appearance of the crop that led you to regard the land as lacking in uniformity? Was it obvious from the crop?—It was not so obvious from the crop as from the harvest.

54,186. At the present time the Pusa Estate is laid out very largely in the interests of cattle, with a certain area set aside for experimental work?—Yes.

54,187. I want to get your opinion as to the value of the farm as an experimental station. You have not a high opinion of it?—Not particularly high.

54,188. The present course for the degree at Edinburgh is four years, is it not?—Three years for an ordinary degree. For an Honours Degree it is four years.

54,189. How many science subjects are obligatory?—Four—botany, chemistry, zoology and physics.

54,190. How many optionals, in science?—There are no optional subjects.

54,191. What about entomology?—Entomology is also obligatory, and bacteriology is obligatory.

54,192. So you have six obligatory subjects?—Yes; there are actually seven obligatory science subjects, including geology.

54,193. Are there no optional subjects?—There are optional subjects, agricultural engineering, field engineering and forestry and veterinary hygiene. Genetics is grouped either with forestry or with agricultural engineering as optional.

54,194. What prospect would there be of getting recruits from the University of Edinburgh for service in India if there was no permanency guaranteed?—I do not think there would be any prospect at all. There is a pretty keen demand for graduates from other agricultural departments, and the best of our men usually get placed there. I do not think they would at all consider a Service with no permanency attached to it.

54,195. Have none of your people taken up temporary appointments recently in India?—None whatever.

54,196. Do any of the College of Agriculture students take temporary appointments abroad?—Apart from the University Degree? It has not happened in recent years at all.

54,197. *Mr. Noyce*: Am I right in interpreting your view to be that students in this country who go to Universities and Colleges for agricultural

study are mainly attracted, as they are in India, by the prospect of some definite appointment?—Very largely.

54,198. That tendency is marked in this country too?—It is, yes.

54,199. *Professor Gangulee*: Also in America?—Not to the same extent.

54,200. *Mr. Noyce*: Just two questions about Egypt. Is maize the usual rotation with cotton there?—It is.

54,201. Have you considered the possibility of *berseem* as a crop in India at all? You know both countries?—I think *berseem* should do in India in reasonably cold winters. It does not stand any severe degree of heat. In Egypt, its best period of growth is from January to about the end of May, when the weather is just warming up; but directly we get to the high temperatures of summer it is practically finished.

54,202. It would not have much chance really, except in the north of India in the cold weather?—No, it would not.

54,203. The trouble is that it does not seed there?—No.

54,204. In order to do anything with it in India, you would need a constant import of fresh seed?—Yes.

54,205. *Sir James MacKenna*: What is the organisation of the Agricultural Department in Egypt now?—At the top there is the Minister of Agriculture, who is assisted by an Under-Secretary of State. Then, directly under the Under-Secretary of State, come the various departments. The post which I myself held there has not been filled since I left the country (the post of Director-General of the Technical Services), so that each Service now attaches directly to the Under-Secretary of State. First of all there is an Inspectorate Service. The Agricultural Inspector corresponds to the Deputy Director of the Agricultural Services in India. There are 14 Provinces in Egypt, and each Province has an Inspector. These are all grouped under the administration of the Chief Inspector of Agriculture at the Ministry.

54,206. Are they all Egyptians?—Yes. They are now all Egyptians. Formerly there were about half Egyptians and half English. Then there are several scientific departments—Departments of Chemistry, Botany and Entomology, and there is the Veterinary Service.

54,207. Are they all manned by Egyptians too?—Mostly. There are about five or six English personnel left in the Ministry, and these are all junior appointments.

54,208. Is the Khedivial Agricultural Society as active as it was 20 years ago?—No. It practically died when the Ministry of Agriculture came into being.

54,209. They were the people with the biggest scientific staff when I was there 20 years ago?—Yes. Directly the Department of Agriculture was formed, most of the staff moved over from the Khedivial Society to the Ministry of Agriculture.

54,210. With regard to the question of Egyptian cotton, have you ever visited Sind?—No.

54,211. You are aware of the Sukkur Barrage. They are banking a good deal on utilising the irrigated land for the growth of Egyptian cotton, are they not?—Yes.

54,212. Is not the market for Egyptian cotton somewhat limited?—It is a good deal limited, but it is difficult to say how limited it is, because very often a new supply creates a new demand. It is difficult to predicate before hand what the demand is going to be.

54,213. The correct policy would be a long staple cotton, either Egyptian or American?—Yes.

54,214. Has Egypt any Acts dealing with cattle diseases, the movement of cattle, the destruction of hides, and so on?—Yes, that is covered by legislation.

54,215. You say simultaneous inoculation has been fairly successful. By what officers is that inoculation performed?—Just as in the Agricultural Service we have our Agricultural Inspector, so in the Veterinary Service there are local Veterinary Inspectors, fairly senior men, Egyptians all of them.

54,216. With a veterinary qualification of any recognised standard?—They are trained in the Veterinary School in Egypt. Simultaneously inoculation, or double inoculation, is carried on by them.

54,217. It would not be done at the hands of a Veterinary Assistant, would it?—Sometimes. Frequently the Assistants actually do the job. I ought to say that in one or two cases in the early days rather bad accidents occurred, but in recent years nothing very untoward has happened. In one or two cases in the early days complete herds were wiped out through faulty inoculation.

54,218. *Professor Gangulee*: Do I understand you to say that agricultural research in Egypt is chiefly in the hands of the Egyptians?—Almost entirely.

54,219. What do you say about the efficiency of the research work due to this process of Egyptianisation?—I am afraid such work will go to pieces altogether. It has very largely gone to pieces. I would not say that is entirely the fault of the Egyptian staff. It is very largely due to bad administration generally. With this bad administration the better members of the Egyptian staff are not getting the encouragement that they ought to get. Apart from that, as a prominent Egyptian once said to me: "In many respects I have tried to imitate the European, and I flatter myself that in many ways I have succeeded, but in one particular I have grossly failed, and that is not being able to maintain, for any length of time, a sustained interest in anything in the way of research." That is rather characteristic of the Egyptian mind.

54,220. Where were the Egyptians, who are now in charge of the Scientific Department, trained?—In many cases they were trained in the country. The older men were all trained in the country. They have reached their present positions by virtue of their seniority rather than by virtue of their academic qualifications. Among the younger men, a good many have been trained abroad, some in this country, and a good many in recent years were sent to America.

54,221. Sent by the Ministry?—Yes, specially selected, and the Universities to which they were sent were very carefully selected.

54,222. Has agriculture, as a teaching subject, found a place in the University of Egypt?—It is only within the last two years that a nucleus University seems to have been established. Previous to that there was no University of Egypt. There was a so-called University of Cairo, but it was a name really.

54,223. What is the nature of the higher teaching in Egypt?—It is a series of higher colleges.

54,224. How many are there of such colleges?—There is a School of Medicine, a School of Engineering, a School of Law, a School of Agriculture, a School of Commerce, and a Training College for Teachers.

54,225. I think Egypt has a research station for investigating soil and irrigation problems, has it not? Dr. Prescott was in charge of the station?—Dr. Prescott was a member of the staff of the Khedivial Agricultural Society. He was Chemist to that body.

54,226. He investigated, chiefly, the question of alkali soils, did he not?—He took that up amongst other things. He was not specifically there for that purpose.

54,227. All that research work has been discontinued since the process of taking Egyptians into the service has commenced, has it not?—It has been very largely discontinued.

54,228. Is there such a thing as a farm institute in Egypt?—No. We had farm schools, and they were a complete failure.

54,229. On page 236 of your note, you say it was found that a substantial number of pupils, usually children of poorer parents, were perfectly willing to enter a farm school and to engage in all the practical operations prescribed. To what do you ascribe the success in interesting the parents in those schools? What was the secret of that success?—They were prepared to undergo a little pain in order to arrive at a future happiness. Their whole ambition from the beginning was to get qualified for some kind of post; and in order to arrive at that goal they were prepared to suffer unpleasantness for a time.

54,230. Are you prepared to say that the parents of these Egyptian children are satisfied with these schools?—Only from that point of view, as leading to a post.

54,231. Who are the teachers in these schools?—They were Egyptian graduates of the Higher School of Agriculture.

54,232 Did I understand you to say that the yield of wheat per acre in Egypt was 55 bushels?—That is high. The average would probably be nearer 37 or 38.

54,233. In England the highest yield is 32 bushels to-day?—Not the highest—the average.

54,234. From your calculation which you gave to Sir Ganga Ram I got the figure of £34 per acre as a gross income?—That would be about the total return.

54,235. £20 for cotton, £7 for maize, and £7 for wheat?—These are the returns per half-acre. Part of the land would also be under clover for the winter.

54,236. What would be the rent of that land?—Anything from £12 to £15 an acre. Immediately after the War, some of that land was being rented at £60 an acre, when cotton was booming.

54,237. You said that a substantial amount of fruitful research was carried out in horticulture. What definite results have been obtained in horticulture?—It was very largely a question of variety selection in different classes of fruit trees.

54,238. What are the chief fruit trees in Egypt?—One of the most important is the orange, and then there are dates, figs, grapes, apricots, plums, and so on.

54,239. In answer to Sir James MacKenna, you referred to the declining influence of the Khedivial Agricultural Society. What is the reason of that?—The Khedivial Agricultural Society, in so far as its research work is concerned, very largely ceased to function when the Ministry of Agriculture came into being. There was hardly room for both. The Khedivial Agricultural Society did not quite accept the situation. They felt there was a certain amount of prestige attaching to research work, and when the staff went over to the Ministry of Agriculture they recruited fresh staff, but they have never been able to hold the staff for very long, and there are frequent changes.

54,240. You say that this Society was modelled on the Royal Agricultural Society in this country?—Yes.

54,241. That is, a meeting place of officials and of non-officials interested in agriculture?—Yes. One of its principal objects was the organisation of agricultural shows. Latterly they have become very much a trading organisation for the sale of artificial manures.

54,242. It had a research branch also, had it not?—Yes, it had.

54,243. So it had two branches to its work, one publicity and the other research?—Yes.

54,244. That was the original idea of the Khedivial Agricultural Society, to have a central meeting place of all the agricultural interests of the country?—Quite.

54,245. In regard to the agricultural organisations of Egypt, I should like to get from you how these organisations come in direct touch with the actual cultivator. What is the link, for instance, between the Ministry of Agriculture in Egypt and the actual cultivator?—The link is the Inspector of Agriculture, together with his staff. Egypt is a comparatively small country, and the agricultural staff was large relative to the country and the population. The technical district agricultural staff would probably amount to about 150 people.

54,246. Are those Inspectors trained in the Higher School of Agriculture?—Yes. Some of them are European graduates, Egyptians who have passed through an agricultural college or University in this country.

54,247. What is the salary they draw?—Second-class District Inspectors got a salary of £540 to £840. First-class Agricultural Inspectors were on a grade of £720 to £960, and one could pass from one grade to the other.

54,248. Are these Inspectors supposed to be responsible for the distribution of cotton seed, or have you a separate organisation for that?—That was worked generally by a special department in the Ministry.

54,249. Under the Ministry?—Yes, and conjointly by this commercial department and by the local staff. The local staff actually made all the arrangements for the buying of the cotton seed and its actual distribution, but the book-keeping was done by the commercial department.

54,250. You have no organisation for dealing with crop quarantine?—Yes.

54,251. Was a special officer engaged to look after that?—It was organised under the Entomological Department.

54,252. The chief administrative head being the Ministry?—Yes.

54,253. Do the Veterinary Department administer the legislation regarding the control of contagious diseases?—Yes, but under the general control of the Under-Secretary of State, Ministry of Agriculture.

54,254. That was also a separate department linked with the Ministry?—Yes.

54,255. Is the administration of the Higher School at Giza under the Ministry of Agriculture or under the Ministry of Education?—In recent years it has been transferred to the Ministry of Education.

54,256. Are these schools staffed by Europeans or by Egyptian teachers?—They are staffed entirely, now, by Egyptian teachers. Formerly there was a nucleus of European staff. About four or five members of the staff were Europeans.

54,257. Can you tell us the cost per head of the pupils in these schools? They are not free, are they?—They are not free institutions. The fees are extraordinarily low in Egypt compared with the actual cost of the institutions. I think the annual fee was something like £15 for attendance at all classes.

54,258. Surely £15 would not cover the cost?—No. I think it would be nearer £100.

54,259. The difference comes from the State?—Yes.

54,260. If this Commission decided to visit Egypt, what would be the chief points of interest which you would advise us to investigate?—That is not an easy question to answer.

54,261. I mean, to which aspects of Egyptian agriculture would you have the Commission give attention to?—I daresay the Commission would like to see the operations of the Ministry of Agriculture generally. They would like to know, perhaps, something about the organisation of the Ministry. They would want to see something of the actual working of the different sections. Those are fairly well concentrated round about Cairo. The experimental grounds attached to the different sections adjoin each other.

There is a big headquarters station with a fairly substantial station attached to the Botanical and Plant-breeding Department. Then there is the High School of Agriculture with its experimental farm, about three miles from Cairo. There is also the veterinary organisation. The Commission might like to see the veterinary laboratories and the provision they have for research, and the veterinary school also. There is a special Serum Institute where they manufacture serum for inoculation against rinderpest. Those are the chief things in the neighbourhood of Cairo. In the districts, there are one or two experimental farms. The Ministry's main experimental farm is down in the heart of the delta. That is well worth seeing. The State Domain's Administration is of interest, as showing cultivation on a fairly large scale undertaken by the Government Farming Department, not by the Ministry of Agriculture, though I think quite recently the State Domain has become attached to the Ministry of Agriculture; but throughout the greater part of its history it has been attached to the Ministry of Finance. It has a two-fold object. It was designed as a profitable method of exploiting State property, and at the same time, as a great deal of the land was salt land, the department was continually reclaiming land, and as more reclaimed land came into use the better land was sold off to cultivators. It was a very efficient organisation in many respects, and it still plays a very important part in the matter of multiplication of seed stocks. The better grades of cotton, for example, are evolved in the Botanical Department. They are multiplied up to a point at the Ministry's other experimental farms, and then they are carried on, on a big scale, on thousands of acres of these State domains. In that way one is able to let loose pretty large stocks of relatively pure seed, particularly of cotton and wheat. So that I think that might be of interest to visit.

54,262. Should we visit the irrigation systems?—Yes. I think they would probably be of interest.

54,263. Can we derive any lessons from those systems?—It would be very easy to show you land, which had been among the very best land in Egypt, that had gone out of cultivation, almost, for want of provision of drainage. That land, immediately drainage was provided, in the course of a couple of seasons made a wonderful recovery.

54,264. Would the Commission see anything about the methods of distributing water?—Yes. I think they could be seen quite readily. Then there is a certain amount of research being carried out within the Ministry of Public Works at the Delta Barrage. They have a small research staff engaged there investigating particular irrigation problems.

54,265. Turning to the question of University training in Edinburgh, do you consider that the graduates in agriculture from Edinburgh University are suitable recruits as Deputy Directors for Indian agriculture?—Yes. I think those are the people to whom one would naturally look.

54,266. Would you give them a training in a central institution in India before you gave them a charge?—I attach considerable importance to the training at home from this point of view, that it gives one an opportunity of selecting one's men.

54,267. Having selected the men from the Universities of this country, would you allow them to go to an Indian central station in order to get experience before you gave them the responsibilities involved in the post of a Deputy Director?—I would rather get the experience of him in India before sending him over here. I would prefer to take a man who had gone through one of the provincial agricultural colleges, and had done well there, and then possibly have worked for some little time in the Agricultural Department in his own Province, and then send him over here if he was a really first-class man.

54,268. You are referring to Indian students coming to Edinburgh?—Yes.

54,269. I was thinking of the British recruits from Edinburgh to India. Do you think it would be necessary for those English recruits to go through a training in a central research station or central institute somewhere in India before taking up their posts?—I do not think it would be a great deal of advantage. One used to have that system at Pusa in the old days. People came out as supernumeraries. They worked for a time at Pusa and got some little insight into agricultural methods. Then they were drafted out into the districts. I would not say it is not altogether of value, because it does give one an opportunity of getting down to actual cultural methods.

54,270. It familiarises one with the actual problems before the country?—Yes, to some extent, but eventually one has to learn one's work under the conditions under which that work is to be carried out.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Monday, the* 20*th June,* 1927

Monday, June 20th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I.	Mr. H. CALVERT, C.I.E., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.	Professor N. GANGULEE.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.	Dr. L. K. HYDER.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.	Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Sir STEPHEN DEMETRIADI, K.B.E. (representing the London Chamber of Commerce) and Messrs. Ralli Bros.; Mr. H. F. PFISTER (Manager of Messrs. Ralli Bros.); Mr. C. H. TAYLOR (Wheat Department, Messrs. Ralli Bros.); and Mr. L. WILLSON (Freights Department, Messrs. Ralli Bros.).

Oral Evidence.

54,271. *The Chairman*: Sir Stephen Demetriadi, you appear as representing your firm and also the London Chamber of Commerce?—Yes. Possibly it might help the Commission if I made a sort of general statement first, and then that you should interrogate me on that?

54,272. By all means?—You have many technical experts coming here, and they will be able to answer questions on the technical side. I am not a technical expert myself, so that I will, if I may, just give you a general survey. I would like to deal first with that very important article, wheat. I know that exercising the minds of the members of the Commission is the fact that the quality is not as good as it might be. You feel that some improvement is desirable there. I should like to explain that, in my view, the question of quality is, in a sense, secondary—from this point of view: that if you could get exports of wheat on a free scale from India the question of quality would in a measure right itself. I should like to deal with that a little more fully. Before the War, we used to export wheat from India in large quantities, but during the War and after the War the exports fell. For a time they were prohibited altogether, and after that there were only certain quantities which were allowed to be exported. Then, again, with the increased consumption in India of wheat, exports fell very heavily, and, as a result, there has not been in India that spur which the cultivator used to have of keeping up his quality. I do not know whether that is a view which

has already been put before this Commission. We used to export wheat freely, and if the quality was not up to what was expected of that particular grade of Indian wheat which we were exporting, we used to get claims from our buyers here. They used to be preferred against my firm here, and we used to prefer them against our own firms in India, and they used to send them on to the ryot, and he had to pay those claims. That was always a spur to the ryot to keep his quality up for the next season. On the Bombay side, there has been a steady deterioration in the quality of wheat. I believe that if one were to concentrate on producing larger crops the question of quality would right itself; because, if you produce larger crops, it is reasonable to presume you would have larger exports of wheat, which would give that spur, to which I have already referred, to the ryot to keep up his quality. I thought I might say that at this stage, because I am not sure whether the point has been put before you already.

54,273. It is your view that there has been a steady deterioration in quality in spite of the spread of the improved varieties?—Yes. I should like to qualify that by saying that there has been a deterioration in certain parts of India. I do not think it is noticeable throughout India, because Karachi wheat is still to-day a very good wheat. Sometimes it contains more damage than it does in other years. That is inherent, of course, to the crop. It also contains, sometimes, more red wheat than at other times; but my mind at this moment is rather thinking of the Bombay side.

54,274. Is that mainly Central Provinces wheat?—Yes. I would like to say that I link that up with this (and this is one of the points that I do want to make): that before the War, there was a sort of co-ordinating body which was used both for research work in India and also for controlling the whole of India, but now that agriculture is a transferred subject in India and is now under the local control of the Provincial Governments, I think a certain amount of damage has been done to the good which was emerging from that central research body which used to exist in India, and which was on the way to producing good results. Though I fully recognise that it is very difficult (now that the subject has been transferred to the Provincial Governments) to get it back to the Central Government, I feel, speaking of the Indian wheat business as a whole, that it would be a very good thing if some steps could be devised by which Provincial Governments should, in their research work, be under the control of the Central Government, because, as I have just explained, I feel that in some parts (for instance in the Central Provinces on the Bombay side) the quality has deteriorated more there than in other parts; and I think that if there had been that central controlling body that position might not have arisen.

54,275. Is it your suggestion, then, that the central research station at Pusa exercised some control before the Reforms?—Yes. That is the point I am making.

54,276. Are you familiar yourself with Indian conditions?—No. I have been in India. I was in India for many years, but I was not primarily concerned for my firm with Indian agricultural products. I have with me here from my firm Mr. Pfister, who is similarly situated as I am in the firm, and he is, if I may say so, one of the greatest experts on Indian agricultural products, from the merchant's point of view, with whom you could wish to discuss the subject. He can speak with great knowledge of any of the Indian agricultural products with which my firm deals.

54,277. Perhaps you will tell us exactly who these gentlemen are who are with you?—Mr. Pfister is one of the managers of my firm in the same way as I am. Mr. Taylor came along with me because he is our

wheat expert on this side. I thought you might like to put questions to him on the marketing of wheat. He can speak with authority on the conditions of the marketing of wheat. Mr. Willson is our shipping expert in the firm.

54,278. Have you considered, at all, the possibility of organising the Indian wheat trade upon the same principle according to which cotton is organised under the Indian Central Cotton Committee; that is to say, the organisation of research and administration and the organisation of the trade generally, from the grower through the distributing interests, including, in the case of cotton, the factory itself?—(*Mr. Pfister.*) I should say that in the case of wheat there is less scope for such organisation than in the case of cotton. To begin with, in cotton the proportion of the crop that is exported is very much larger than in the case of wheat. Also, cotton is an article which has to undergo various processes of manipulation before it reaches the market, such as ginning and pressing; whereas wheat comes to the market ready-made, as it were.

54,279. You would not have the same opportunity of levying a cess?—Quite, or of exercising any strict control.

54,280. I put the question to you because I thought you might have some views on the particular point, but you do not feel that wheat offers any great prospect of organisation on those lines?—No, not on those lines.

54,281. Have you considered, at all, the possibility of forming, in India, a wheat pool such as is in practice in Australia?—Yes, but I do not think that those kinds of pool are really for the interests of the country as a whole.

54,282. Because of special Indian conditions?—Partly. In order to work such a pool in a satisfactory manner it would be necessary to have what they have in America and Canada, for instance, namely, large public warehouses where the wheat would be delivered by the cultivator and stored, and re-sold and re-delivered afterwards to the purchaser.

54,283. You mean grain elevators?—Yes.

54,284. It is possible to have a pooling system, is it not, without having grain elevators? The Australian pooling systems are worked with bags, are they not?—Yes, but it would make things more difficult; and, on the other hand, I do not think public warehouses (where the goods, once delivered, would lose their identity) are a feasible proposition for India.

54,285. Because of the multiplicity of small growers?—Because of the multiplicity of small growers, and the difficulty of having satisfactory grading unless at very considerable expense. As the qualities are not so even-running as they are in other countries, the grading would present greater difficulties.

54,286. What are the existing grades according to which Indian wheat is sold on the London and Liverpool markets?—It is now all reduced practically to two qualities, the Karachi white wheat and the Karachi red wheat. The other qualities are only exported very occasionally. From the Bombay side it is only after exceptionally good crops (and when crops in other countries have not been satisfactory) that exports in any quantities worth speaking of are possible.

54,287. Is not there a quotation for superior A. and superior B., superior white and superior red?—From Karachi?

54,288. Yes?—(*Sir Stephen Demetriadi*): No. If I may interpose here, about four years ago we had a superior quality of Karachi wheat which I think emanated from one of the Colonies, and I think it was sold by Colonel Cole. He in fact came over and saw me here about the superior quality of Karachi wheat which he wanted to develop; and we did trade for a short time in that superior quality. It was called Punjab No. 11. We paid, if I remember rightly, 9d. a quarter extra for that wheat. The

miller here would only give us 6d. a quarter. Therefore we found we could not trade. Trade did not develop by reason of the fact that we had to pay more. Whether we paid more to the cultivator than the amount of energy and work he put into it or not, I am not sure. Even if we did, I am not suggesting it was a bad thing that he should have a reward for improving his quality; but we did not get that premium on this side, and the trade did not last for a year.

54,289. Just for the sake of accuracy, Sir Stephen, was it in regard to the quality or in regard to the purity of the wheat that particular lots were Classed Superior A. or Superior B.?—(*Mr. Taylor*): It was both. The wheat was quite free from anything. It was nothing but wheat. There was no barley or dirt. It was all of one quality, unlike ordinary Karachi wheat which is a mixture of two or three qualities.

54,290. I have a note to the effect that in the case of Superior A. and Superior B. the 5 per cent. barley and 3 per cent. dirt allowances were reduced to 2 per cent. and 1½ per cent. respectively?—As a matter of fact, there is nothing known on this market as Superior A. and Superior B.

54,291. We are not talking about the same thing?—(*Sir Stephen Demetriadi*): No. There has been an effort in Karachi to improve the quality, and I am sorry to say it has not met with the success that it deserves, because the millers could not pay the premium which was required. We ourselves could buy this quality of wheat in Karachi and probably mix it with the inferior quality and tone up the general standard of our shipments; but, *per se*, as a quality it had a very short life. I do not think it lasted twelve months. (*Mr. Taylor*): Another trouble was that the quantity available was only about 5,000 tons a year, and it was worth no one's attention to bother about.

54,292. Was this before the War or after?—Since the termination of the War.

54,293. What do you say as to the general demand for Indian wheat?—(*Sir Stephen Demetriadi*): After the War, there was certainly quite a disposition on the part of the Trade here to buy Indian wheat, as it used to before; but it was not offered in free enough quantities, the result being that the millers were rather chary about buying Karachi wheat, because they were never sure whether he would get a regular and frequent supply of it; it might at any moment dry up. When that took place they had to change their mixings. They had to change them once or twice, and they got rather tired of that, and therefore they ceased to take the interest in the Karachi wheat which they used to take in former days.

54,294. So that the uncertainty as to the surplus margin which would be available for export is an important factor in reducing the general demand for Indian wheat?—Precisely so. That was the point I wanted to make when I said I thought the question of quality was rather secondary. The question of quantity is, to my mind, of paramount importance, because, as you know, the results shown per acre in India are lamentably low as compared with other countries. India shows ten bushels to the acre as an average; in Europe we show about thirty bushels to the acre. In the Plate they do not show anything like that, but India is undoubtedly the worst, and if India could be encouraged, if there could be intensive education for intensive cultivation, I think India would soon again be a very large wheat-exporting country. The question of quality would look after itself. It would right itself by the claims that came out from this side in the first year, if the quality was not what we had been accustomed to receive.

54,295. I have a question here with regard to the milling qualities of English wheat. Do those wheats supply the strength which is necessary in a wheat to be mixed with English wheat?—The cardinal point about that is that the Indian wheat is dry. It is deficient in strength. It is deficient in gluten, which is the strengthening element.

54,296. Nobody knows what strength is, do they? Nobody knows precisely the quality which brings strength?—No, it is largely a matter of conjecture.

54,297. Its advantage, for mixing purposes, is in its extreme dryness?—Its primary advantage; and its whiteness, too.

54,298. Do you conceive it as possible that, by a substantial improvement in quality and by a grading up of the purity, Indian wheat might enter a market in Great Britain and other countries overseas which at present it does not enter?—No, for the reason that I have given you. Exports have fallen to such a low level that wheat will soon not be exported. I want to see a large export. If you get the quantity increased and get free exports we will then get the better quality appreciated here; but, if you improve the quality and not the quantity, then that wheat will not come here. It will not be put to the test which you have just put to me, as to whether it will receive a good reception here.

54,299. Let me put the question in another way. Are there any circumstances inherent in Indian agriculture which make it impossible that Indian wheat exported should compete, for instance, with good-class Manitoba or South-eastern European wheat?—(*Mr. Pfister*): I should say, in that respect, that there are some qualities of Indian wheat which could compete with Manitoba, but those are precisely the qualities which have been taken up by the local consumption, and have practically disappeared as exported wheat.

54,300. You do not see them?—We do not see them. They do not come to us. I remember, when I went out to India first, the exports from Bombay were very nearly equal to those of Karachi, and the qualities exported from Bombay were to a great extent the hard varieties, which used to go to the Mediterranean Ports. A good many went to Italy, where they found them suitable for the manufacture of macaroni. They have entirely disappeared now. Ever since the native of India has taken to wheat more than to other food grains (which he can do now because he is better off than he used to be) he has gone in for these very qualities which we used to export. It is only very rarely that we get a very insignificant quantity for export.

54,301. If it were possible to produce, year by year, a steady volume of the highest quality wheat for export, then Indian wheat in overseas markets would meet an entirely new market, and the consideratoin as between quantity and quality, about which you told us a moment ago, would cease to apply to some extent?—(*Sir Stephen Demetriadi*): Possibly yes. Possibly at this stage, it might be well if I drew attention to the fact that in pre-War days Indian wheat used to be sold by the quarter of 492 lbs. After the War, when I returned to my firm and I became answerable for the wheat business, I always found a great difficulty in getting buyers to appreciate that point. Indian wheat was always quoted at a price which was unattractive because it was so much higher by reason of the fact that a quarter of Indian wheat was 492 lbs., whereas all other wheats—competing wheats—were 480 lbs. Obviously, the price of Indian wheat was unattractive. I made it my business to try to get Indian wheat put on to the 480 lbs. basis. There was great opposition, but it was very important that I should get that brought about. It was very important for my firm. Take, for instance, a firm which deals in, say, half a million tons of wheat: if it does not get that wheat from India it does not mind, because it has branches probably in Australia, in the River Plate, in America or in Canada, and so long as it gets its 500,000 tons of wheat it does not very much care where it comes from; but in the case of my firm, we are practically exclusive traders in Indian wheat, and therefore it is very necessary that India should get a share from the

point of view of our own pockets. After a considerable time Indian wheat was put on to the 480 lbs. basis, so now it is readily comparable with foreign wheats.

54,302. Did you meet with any opposition from the people who were buying at 492 lbs. and selling at 480 lbs?—Yes.

54,303. *Professor Gangulee*: Is that 480 lbs. the unit recognised in the East Indian Wheat Contract?—It is. The contract now is for 480 lbs.

54,304. *Sir Ganga Ram*: Is it 480 lbs. pure?—Yes. They do not pay for the dirt, whatever it is.

54,305. *The Chairman*: How does Indian wheat come on to the European market in relation to the Antipodean wheat and American wheat. Does it, in the main, arrive in Europe between those two crops, the Northern hemisphere and the Southern hemisphere crops?—The Indian crop generally fills the gap. The Pacific wheats come in August and September. We get Manitoba wheat in October, and then we get Australian wheat commencing in December. May, June and July are the months when India supplies Europe with large quantities of wheat. It is the gap which has to be filled. India is the one country that does supply that gap. Therefore, it has that definite advantage.

54,306. It is suggested in some quarters that bulk storage and handling might profitably be introduced into India. Have you any views upon that question?—(*Mr. Pfister*) On this question opinions vary considerably, even amongst the shippers in India. It was suggested at one time that the system might work, provided we had elevators all over the country.

54,307. That is to say, you must have bulk storage for your internal consumption as well as for your export?—Yes.

54,308. Now that the export has dwindled down to a very small percentage, the question to consider is whether from the general point of view, internal storing, this storing in bulk would be advisable or not. Can you contemplate a system according to which there would be bulk storage at the ports, without up-country elevators?—No. I do not think it would pay.

54,309. In your experience, at what point in distribution is the maximum of damage inflicted on the wheat, damage due to weevil and damp, and so on?—At the harvest period the damage done is the result of carelessness on the part of the cultivator, probably, more than anything else. The damage as regards weeviling is done mostly at the port of shipment, because, by the time the goods have reached the port of shipmnt, the climatic conditions there lend themselves to the development of weevil.

54,310. You mean, the wheat is infected before arriving at the port, but the damage is done at the port?—Yes, as regards weeviling; but in other respects probably the inferiority of the quality, the question of admixture, is simply due to carelessness, first in the seed which is used for sowing, and in the harvest. In the Central Provinces, for instance, where a good deal of wheat is grown on what is known as the black cotton soil, the mixture consists very largely of little lumps of this black soil, which is due to the wheat being uprooted and little lumps of soil remaining attached to the root. If harvesting were done more carefully that mixture could be prevented. It is one of the objectionable features in a quality of choice Bombay wheat which would be very much liked on this side, otherwise.

54,311. Have you come to any firm opinion as to whether an elevator system and bulk storage would be profitable as regards the internal trade in wheat?—I am afraid it would prove too costly, because of the supervision and the superintending staff which would be required.

54,312. If bulk storage were to be introduced, would it require, in order that full advantage be taken of it, some structural changes in the ships carrying wheat from Karachi?—(*Mr. Willson*): Steamers which carry wheat from Karachi are precisely the same kind of steamers that carry wheat in bulk from all other countries of the world. The only difference between a tramp steamer which carries wheat in bulk and a steamer which carries wheat in bags lies in the "shifting" (regulating) boards, and every steamer supplies those when necessary. A tramp steamer could be turned from a bag to a bulk carrier within a few hours. So there is not much difference in the construction. (*Sir Stephen Demetriadi*) I do not think you need anticipate any difficulty there.

54,313. *The Chairman*: Would your firm look with favour on a proposal to introduce the bulk storage and handling principle?—I do not know that we would mind whether it was introduced or not, so long as we had our trade. We would welcome anything that was a good thing for India.

54,314. Would you, yourselves, feel disposed to step forward and, in part or in whole, finance the elevator system?—That is not our method of business.

(*Mr. Pfister*): We would adapt ourselves very readily to any conditions of that kind. (*Sir Stephen Demetriadi*). We are really the Carter Patersons of India. We are carriers.

54,315. Are you satisfied with the present standard of wheat; that is to say, the present F.A.Q. standard?—(*Mr. Taylor*) The Karachi Fair Average Quality standard is the only standard which really counts now. That is a fairly good standard, and is regarded here with favour. Other qualities become more or less forgotten. In the trade, when one speaks of Indian wheat one thinks of Karachi wheat.

54,316. We as a Commission, Sir Stephen, are of course concerned mainly with the interests of the grower?—(*Sir Stephen Demetriadi*) I recognise that, and therefore that is the point I wanted to make, namely, that the grower should be interested in getting larger crops. It is a line on which a good deal could be done in order to get back trade which has been, not lost, but seriously handicapped in the last few years. There should be better methods of cultivation, a freer use of fertilisers and a research department, as I indicated at the beginning, under central control. There should be a sort of directing body for the benefit of cultivators generally in India, so as to preserve a certain amount of uniformity throughout the country which has not existed since agriculture became a transferred subject.

54,317. Would you agree that, as regards not only wheat, but all agricultural produce, improved practice by the grower is more likely to follow from the enjoyment by the grower of a fair share of the increased and enhanced value due to improved quality than from any other stimulus?—I think so. (*Mr. Pfister.*) May I emphasise again what Sir Stephen said about the importance of quantity? Take cotton. What the cultivator wants chiefly is to grow a crop which will give him a large quantitative yield. For instance, in Sind and in the Punjab there has been growing, in recent years, what they call the Punjab-American cotton. The cultivator got a better price for the cotton, but for the *kapas*, that is to say, the cotton with the seed, he got a lower price, because the yield of this better staple cotton is smaller than that of the short staple varieties. Therefore, if a cultivator can grow a short staple cotton which will yield him a larger yield in *kapas* and this *kapas* gives a larger proportion of lint than the better variety, he will every time give preference to the variety which gives him the quantity quite irrespective of the quality, and he will get more money for it.

Sir Stephen Demetriadi.

54,318. *Mr. Noyce*: If that is so, why has American cotton spread so largely in the Punjab?—It did well for the first few years, when the seed was introduced. It yielded a very satisfactory quality, approaching very nearly to the American prototype, but every year it goes on, unless fresh seed is introduced, the cotton has a tendency to deteriorate and to revert to the indigenous type.

54,319. *Professor Gangulee*: What was the incentive to introduce this American cotton?—The incentive, in the first place, was the very high prices ruling for American cotton just after the War. Now that the American cotton has fallen very much in price and now that they have had crops of 16 million bales in America, and now that it has come to the point that the American cotton produced is in excess of the demand, the price has come down to such a level that there is no longer the margin which there used to be; and I am afraid, as things go on, that we shall have to reckon with these large American crops; and, therefore, with a reduced margin, the better chance of selling Indian cotton is to sell those varieties which are the indigenous ones and which have the characteristics of the old Indian types.

54,320. *The Chairman*: I should like to ask you one question, Sir Stephen, in your capacity as Chairman of the Chamber of Commerce. Has the Chamber any suggestions to make for the improvement of the organisation of the trade?—(*Sir Stephen Demetriadi.*) No. I do not think the Chamber considers that any improvement is required.

54,321. Have you anything to say about the efficiency or the reverse of the service rendered by the Indian Trade Commissioner or by the High Commissioner's office generally?—No. The Indian Trade Commissioner has done a lot of valuable work. I have been in close contact with his office. I must say that I feel that in the days when he had an office in the City he had a greater opportunity of doing useful work than he does to-day, although to-day, I think, under the difficulties with which he labours he does extraordinarily good work.

54,322. You refer to the difficulty attaching to his office being in Grosvenor Gardens rather than in the City?—Yes. When the Trade Commissioner's Office was abolished in the City, I myself took steps to help the Trade Commissioner in the matter of an office somewhere in the City. I happened to be closely connected with the London Chamber of Commerce, as I am to-day, and the Chamber placed at the disposal of the Trade Commissioner then, and it is still at his disposal, a room in the London Chamber of Commerce, at which he attends at regular hours twice a week, and people in the City know that he is there. How long the London Chamber will extend that facility I cannot say. I think I am right in saying that the presence of the Trade Commissioner actually in the City is of great importance from the point of view of making known the various trade conditions of India to people who require that information in the City. I am aware that large firms say that they do not require the Trade Commissioner and that all information which they want they can get themselves from India from their own offices and agencies; but, speaking for the trade as a whole, I think the City Office is rendering valuable service, and service which is to the advantage of India.

54,323. Has it ever occurred to you that the Commissioner might obtain useful information if he were advised by a small group or committee representative of the various interests concerned, at this end, for the marketing of produce?—I think that is essentially the sort of work which the Trade Commissioner should find out for himself. I do not believe in a bureau of the description you have just mentioned.

54,324. I have a note here to the effect that one of the principal objects for which the British Federation of Traders' Association was formed was to protect the interests of shippers in all matters relating to bills of lading,

with particular reference to Indian and Home trade, in the system of deferred rebate which is adopted for part of that trade by the various shipping interests concerned. Is that correct?—That is correct.

54,325. Has the system of rebates some effect in maintaining high rate freights in your opinion?—Undoubtedly.

54,326. Will you develop that a little?—They do not arise to-day to the same extent as they did before. The deferred rebate system applies more particularly to the Calcutta side of India. It does not apply to the Bombay and Karachi side. I will explain later why. It applies in a way, and is enforced in a way which prevents competition between liners and tramp owners. The system is for bookings to be made during, for instance, January, February and March, and for a rebate, which is 10 per cent. on the freight rate, to be paid, not at the expiry—(this is the point I am very strong upon)—of the three months' period, January, February and March, but on the 1st July, and only then on the condition that you have remained loyal to the Conference during April, May and June, although you are only going to get your rebates on the period January, February and March. The effect of that is that you are tied in perpetuity to the Conference. Therefore, there is no opportunity to bring healthy competition into play against the rates which the Conference is asking. I am not saying that some tie between the shippers and regular liners who give a regular, frequent and efficient service is not desirable. I think it is, but I feel very strongly that rebates should not be deferred in the manner in which I have just described. There is a conference in Calcutta known as the Pacific Conference. It was in force when I was in India many years ago. It was then largely controlled, I believe, by the Apcar line. They have a rebate system, but as soon as that rebate is earned it is paid; it is not deferred. You may make a contract for six months, but at the end of six months it is paid, and it is not deferred like this pernicious system (I use the word advisedly) which prevails now and which has, I fear, the effect (as it prevents shippers from going outside the Conference) of preventing rates from coming down as and when the market is declining. When the freight market is declining, if those Conference rates do not come down the Calcutta trade suffers, and more particularly that portion of it which competes with other countries. I am thinking at the moment of linseed. Linseed competes with the Plate largely. If the Calcutta Conference rates do not come down to the world's level of freights, then Calcutta loses trade, as shippers cannot go outside the Conference because the rebate offered is so large (it is 10 per cent.) that it is practically the commission which shippers get upon the linseed business. Therefore shippers cannot afford to ignore it, and they remain tied to the Conference for that reason. I am not suggesting, once the liners are allowed to have a rebate system, that there is anything wrong in it from their point of view; they are only looking after their interests, but, looking at it from the interests of India, I think it is harmful to India to have the deferred rebate system in force, and I think it is definitely wrong.

54,327. You support your view by a specific reference to a comparison of the rates as between Calcutta and other ports?—I must say that since I gave evidence before the Imperial Committee some years ago on this particular point, the Conference have kept their rates from Calcutta more in line with the rates prevailing in the world's freight markets. Therefore, the complaint I had to make some years ago to the Imperial Shipping Committee does not arise, or, at any rate, does not arise to anything like the same extent to-day as it did then, because the rates, as I have just said, are more or less in line with the world's freight markets. That may be due to the fact that the liners have to keep their berths, and export trade from India is not very large at the moment. Therefore they must get as much cargo as they can; but if trade were to improve and rates were to

go up, if the pendulum swung the other way, I fear the Conference might not bring down its rates quite as readily, and then Indian trade would suffer. That applies to the Calcutta side and not to the Bombay and Karachi side. Perhaps it may be of interest to know why it does not apply to the Bombay and Karachi side. It does not apply there because, there, wheat and seeds are exported in such large quantities that shippers can do their own chartering, so that they have that as a check on rates being too high. If a conference were to exist on the Bombay-Karachi side, I do not think it would get much support, because we shippers would be able to do our own chartering, and would have no need to go to the Conference for space that we require in their steamers in order to ship our goods. In Calcutta, however, we do not ship wheat and linseed in the quantities we do on the other side of India, and we are more or less dependent on liner space. Two years ago, a Conference was established on the Malabar coast. We have to see what effect that will have on the trade.

54,328. Do you suggest it is within the power of this Commission to take any steps or to make any recommendation which might have the effect of terminating this principle of deferred rebates?—I do not quite know what your terms of reference are, but I know that this question has been fully considered by the Imperial Shipping Committee, and I think they recognise the point I have made. They did put in a recommendation then that the shipper should have the right, instead of being tied by deferred rebates, of making a contract with the liners. But I am afraid it misfired, because the contract was so onerous that it was quite impossible to accept it.

54,329. Was there any suggestion that there should be statutory control, that there should be, by law, any prohibition of any particular arrangement?—No.

54,330. *Dr. Hyder*: Is the Imperial Shipping Committee still in existence?—It is a Committee which is in existence to-day. I think the Trade Commissioner is now the representative of India on it.

54,331. *The Chairman*: When we were in Bombay we had the advantage of putting certain questions to your head managers in Bombay, and they gave us some evidence over the whole range of the firm's activities in India. Have you read that evidence through?—I have, I cannot say that I have digested it all. Probably Mr. Pfister has read it more attentively than I have.

54,332. I do not propose to take you through it in any great particularity to-day. I merely want to ask you whether you wish to comment on anything which was said by your firm's representatives there?—I should like to say something on the question of the damping of cotton. I know you are concerned about the damping of cotton. Speaking for my firm, traditionally we do not damp cotton, but after having looked into the matter I personally feel that if I had to take a decision for my firm I should very seriously have to consider whether the time had not come when we should damp cotton in self defence, because it is affecting our trade. It would be a thing that would go against the tradition of my firm, because it is a method which we should not like to follow, but it is affecting our trade, and unless something is done we may have to reconsider our position as regards the damping of cotton. It is a point which has not been decided by my firm, but it is a question which we may have to re-consider. I know it has been said that legislation in India to prevent damping of cotton would be a good thing, or possibly a combination of shippers to regularise their methods of pressing the bales, but I am not at all satisfied that either of those suggestions is practicable. I think myself it ought to come more from this side, and as you are taking evidence from the Oldham Master Cotton Spinners' Association, they are the people who would be able to speak more authoritatively on the point than I can because they are the receivers of the cotton. I do not

know, but it seems to me quite possible, although rather difficult, to be able to determine the amount of moisture in a cotton bale when it comes here. The amount of moisture in wheat is determined by the analytical chemist. I do not know whether he can determine it in cotton. I imagine it would be more difficult, because cotton is more susceptible to the atmospheric conditions prevailing on the day when the bale is opened; but a certain percentage might be admissible. In the contract on this side, there might be penalties imposed for excessive damping of cotton. That may be a way of preventing undue and heavy damping of cotton. On the other hand, one has to recognise that in certain parts of India a certain amount of damping may be necessary in regard to cotton, in order to enable one to press the bale or preserve the cotton from breaking because of its brittle nature. It is a difficulty of which I do not see the solution.

54,333. Is it on account of short weight which any damping involves, or because of the damage to the cotton which follows the practice of damping, that firms on this side are interested in this practice?—(*Mr. Pfister*): If the damping is done judiciously, without the water being actually thrown on the cotton, it is all right. I remember when I was in India the natives used to put little earthenware pots full of water round the loose cotton overnight, and in the morning the water had been absorbed by the cotton. The cotton required just that amount of moisture to enable it to be pressed in a satisfactory manner. Far from doing any harm to the cotton, it rather tended to improve the staple, because when the cotton is pressed too dry, on arrival here the staple is brittle and breaks. Anything of that kind is quite legitimate and permissible, but the trouble is that, as the native found, apart from the advantages of pressing the cotton better and improving the staple, he got also a considerably heavier weight, he started using the hose on the cotton, and in some cases now the cotton is probably damped to a degree which will affect the staple adversely. It also leads to the cotton getting a greyish colour and losing its bloom.

54,334. *Sir Ganga Ram*: Has a law been framed against that?—I do not know that any measures have been taken. Something was contemplated, but I think it would prove very difficult, if any such law were passed, strictly to enforce it.

54,335. *Professor Ganguler*: Do you think the water hose is used by the cultivators?—No, it is generally used by the middleman or the gin owner. (*Sir Stephen Demetriadi*): We have reached the point, or we are coming near to it, when it is not so much a question of competition in cotton as competition in the adulteration of cotton!

54,336. *Sir Thomas Middleton*: Would there be any difficulty in administering the law in cases where one went into a ginning factory and saw a 2-inch or a 3-inch hose on the premises, and the floor in such a condition that it looked like a stable which had been washed out?—(*Mr. Pfister*): It would simply lead to the damping being done further away. (*Sir Stepen Demetriadi*): It is a very difficult matter indeed. I think the respectable firms would be the sufferers, because they would conform to the law and others would not.

54,337. *The Chairman*: You mean that most firms are damping. Is that the position?—My firm are not. I would like to put it in that way. (*Mr. Pfister.*) Certainly, most cotton that comes down during the season to the Bombay market from the Berars or the Central Provinces has been damped at some stage or other. When we buy in Bombay, as we have to do because it is the largest market, we buy cotton which all of us suspect of having been damped, and we have no means of knowing or controlling the extent to which it has been damped. Once the bale is pressed it is very difficult to determine.

Sir Stephen Demetriadi.

54,338. *Dr. Hyder*: It is for you, gentlemen, not to be so meek and patient, but to raise a hue and cry. If you lie low the practice cannot be stopped.—It is difficult to get everybody to act together in the matter.

54,339. *The Chairman*: Do you wish to say anything about the quality of Indian cotton, in particular about the quality of Punjab cotton of the 4 F. variety?—No. I am not sufficiently versed in the technical points of the cotton business to give evidence on that. (*Sir Stephen Demetriadi.*) I should like to refer to our anxiety to increase the export trade of India. I know I am in the minority when I speak in the way I am going to do, but I should rather have preferred to have seen India go through a bad monsoon before the rupee was fixed at 1s. 6d., because, with a bad monsoon, I believe the rupee would have tended to have gone back to its old point of 1s. 4d., at which point it would have been an incentive and encouragement to Indian exports. It would give a fillip to the export trade which is so necessary and what we are looking for. I might be told as against that, "Well, if the rupee was at 1s. 4d., as India has so many heavy financial liabilities outside and requires money, there would have to be something of a counterbalance in the form of possible increased taxation, or something of that description," but I believe that that incentive which is wanted would be forthcoming if the rupee was at 1s. 4d. to-day. I know I am expressing my own individual view on that.

54,340. Do you wish to say anything about the damping of groundnuts?—(*Mr. Pfister.*) As regards the damping of groundnuts, more or less the same thing may be said as with regard to the damping of cotton. There, too, the original damping was done for quite a legitimate purpose. When the groundnut has to be decorticated, either by the old primitive method of beating the shell with sticks or by passing the groundnuts through a decorticating machine, if the groundnut does not contain a certain amount of moisture, whether it is the moisture arising from the freshness of the seed or moisture from the atmosphere, if it is too dry the nuts become apt to be split up; the skin comes off, and not only do they presnt an unsatisfactory appearence, but they are apt to become rancid more easily than when the kernel remains whole. So, in order to get the kernel whole in passing through the machine, a certain amount of moisture was necessary. There, too, they started by damping the floor round the heaps of groundnut before passing them through the decorticating machine. Then they went a little further and sprinkled water on the shell, and in the end they threw buckets of water over them, and there has been, especially on the Madras side, a considerable amount of damping done in excess of what was really necessary:

54,341. *Professor Gangulee*: The excess of moisture would interfere with the process of decortication, would it not? It would soften the shell?—It softens the shell, but it prevents the kernel from becoming too dry and splitting. It is the kernel inside the shell that suffers. If it is overdone then there is a difficulty in getting the shell through the machine. But, as I say, it is chiefly in the Madras Presidency that this practice has been overdone. On the Bombay side there has been very little to complain about.

54,342. *The Chairman*: Are you personally familiar with the details of marketing in India at the cultivator's end of the chain?—I am fairly well acquainted with them.

54,343. Have you read the evidence given by the firm's representatives in Bombay?—Yes.

54,344. Do you agree with what they say?—Yes. (*Sir Stephen Demetriadi.*) I should like to say that the remarks I made about wheat and the necessity of having constant supplies coming forward, apply not only to wheat, but to barley and gram. I say barley in particular, because, about three or four years ago, we really were making good progress to interest even the

quality; but suddenly we could not buy the barley, it was not exportable; but there are possibilities of developing the Indian barley trade with Europe. Year ago, I remember we handled about 300,000 tons, which is quite a quantity; now we do nothing because Indian barley is completely out of line.

54,345. *The Chairman*: Have you yourself formed any view as to the effect which the Sukkur Barrage area, when that barrage is in full working order and the land is irrigated, is likely to have on these problems?—Yes, we are looking for an increased export trade from India.

54,346. Does past history show that an extension in the irrigated area produces an increase in the surplus available for export?—(*Mr. Pfister.*) If the Sukkur Barrage is going to do what is expected of it, it will certainly increase the quantities available for local consumption and leave over a surplus for export. The other canal schemes that are already in full working have certainly yielded very appreciable results. I am referring to the Sutlej Canal, the Chenab Canal and all those canal schemes; they have certainly helped to grow very much larger quantities.

54,347. Have you not found that, from the export point of view, the increase in the population following irrigation and also the increasing tendency to turn to wheat as a staple food has offset that increased production?—Yes.

54,348. You do not think that process is likely to operate in regard to the Sukkur Barrage?—On the Sukkur Barrage they ought to be able to keep pace with the internal consumption and have an exportable surplus. (*Sir Stephen Demetriadi.*) We expect that what we lose on the swings we shall more than gain on the roundabouts.

54,349. *Professor Gangulee*: Sir Stephen, you referred to the steady deterioration of wheat in quality?—I beg your pardon, I said in parts of India, not generally.

54,350. Would you ascribe that to the decentralisation of agricultural research?—I think in a measure, yes.

54,351. Was this deterioration reflected in the price of wheat in any way?—I cannot say, because wheat was not exported; it was consumed locally in India and what price it fetched locally I do not know.

54,352. So that the deterioration of wheat in quality did not affect the trade in any way?—It affected the export trade.

54,353. How, you do not sell wheat according to its improved varieties? You sell by quantity?—No, we sell by quality.

54,354. When you speak of improvement in quality, are you referring to improved varieties of wheat at the present time grown in India? Your trade do not recognise the improved varieties of wheat; do you follow me?—No, I am afraid I do not.

54,355. I should like to know if the export trade do recognise the improved varieties of wheat such as Pusa 12 or Punjab 8A and so on?—(*Mr. Taylor*): There have not been sufficient quantities of these improved varieties available for export for them to come into question at all here; there has been a little 8A, but only about a thousand or two thousand tons.

54,356. The deterioration in quality did not affect the trade materially?—Most certainly it did; the deterioration of quality caused people who used to buy certain quantities to cease buying it, and in addition to that, we ourselves when we found what the quality was like would not take the risk of shipping it. (*Sir Stephen Demetriadi.*) That is true.

54,357. Hard wheat generally comes from the Central Provinces?—Yes.

54,358. Do I understand correctly that the export of that wheat has been stopped?—(*Mr. Taylor.*) That has been stopped, yes.

Sir Stephen Demetriadi.

54,359. Have you, at any time, referred to a central research station like Pusa, any problem that you would like to have investigated?—(*Sir Stephen Demetriadi.*) That would fall within the province of our firms in India; it would not be for me.

54,360. There are a number of commercial associations in India, such as the Grain Merchants Association, Calcutta; are these associations in any way connected with the British Federation?—No, there is no connection at all.

54,361. You referred to the 480 lbs. unit in the export wheat contract. Do you think the adoption of a uniform system of weights and measures is likely to facilitate the export trade development from India?—We have uniform weights now.

54,362. That uniformity is with reference to the unit of wheat export, but in the country generally there are so many different kinds of weights and measures?—(*Mr. Pfister.*) Yes, I should say if that could be done it would simplify matters considerably; at one time I think it was even considered whether the decimal system should not be introduced in order to simplify matters; but I think it will take a very long time before the people of India as a whole will give up their local weights and measures.

54,363. But I understand the railways have taken a lead in this matter?—They have taken a lead in this matter. (*Sir Stephen Demetriadi*) Generally speaking simplicity and uniformity always tend to help trade.

54,364. Have you any suggestion to make as to how one could secure the desired uniformity?—I do not think I could possibly make a suggestion for having uniform weights in India; I know they are different from Province to Province.

54,365. If we continue such uniformity, only with regard to weights and measures as are in use in the export trade?—I do not know how you could differentiate; when you buy you could not say: "I am buying wheat for export, and therefore it must be so many pounds to the maund."

54,366. The maund differs from district to district?—Yes, from district to district and from article to article. (*Mr. Pfister.*) I should say that, in connection with the export trade, the weight units have been narrowed down to the maund, the hundredweight and the *khandi*, and I do not really think that, at present, much more could be done on those lines.

54,367. Are you familiar with the official crop forecasts of the Government of India?—We have had to follow them very closely.

54,368. In what way do these crop forecasts affect the export trade of Indian agricultural produce?—The public, of course, do attach considerable importance to them, especially on this side; I do not think that in India the people attach the same importance to them.

54,369. Have you any views as regards the accuracy of these crop forecasts?—The only suggestion that I could make is that they ought to be published a bit sooner.

54,370. In the case of wheat, I understand they are published about five times?—Yes.

54,371. Beginning from January 31st to August 10th?—Yes.

54,372. From the exporter's point of view, the forecast of which month would be most important?—I meant in a general way, the publication of all the forecasts should be anticipated in order to avoid what frequently happens now, that by the time the forecast reaches the public conditions have already changed. During the course of the monsoon or when it comes to the winter rains, everything will depend on whether there are sufficient winter rains to help the crops on. Very often, the forecast as to the hope of getting winter rains reaches the public when the time for winter rains is passed; such reports, of course, are not very helpful. (*Sir Stephen Demetriadi.*) I take it the question is: regarding what period of the year are the crop reports more helpful to the exporters?

54,373. Yes, and you see there are five forecasts?—My reply to that is that it depends on whether the trade is buying, for instance, Indian wheat in December, February, March or April or when. That of course depends upon the position of their own stocks. If they are buying in December, obviously they are more interested in the crop reports at that moment; if they are buying in March, March is the time when they want more information. I think, in that way, I can answer generally the question put to me.

54,374. The rush of wheat from Karachi, I think, is during the months of June and July?—Yes, that is right.

54,375. What is the position of the home stocks during those two months?—That is the time when Indian wheat is wanted, as I explained earlier.

54,376. The Indian wheat exports commence when the exports from other sources, such as those of Canada, are not coming to England?—Yes, that is the time, as I have already explained, when Indian wheat is required. It fills the gap between the other harvests. Wheat is then required, and therefore it gets its price.

54,377. If we had a central organisation to go into the research problems of wheat, do you think your firm could suggest any definite problem for investigation as to what you regard as being a gap in wheat research?—In what respect, may I ask?

54,378. With regard to wheat production in India, if you were asked what research problems you would like to see investigated, would your firm be in a position to indicate any to the central organisation?—No, because we have not the scientific knowledge. I was only generalising by saying that if that research body would educate the cultivator to produce, firstly, larger crops, and secondly, better crops, and preserve a certain amount of uniformity in India itself, it would be to the advantage of India. That is the point I was trying to make.

54,379. At the present time I understand from your remarks, Sir Stephen, that you would lay more emphasis on the quantity of wheat than the quality of wheat?—Yes, I do, because the one means the other; the other follows.

54,380. *Mr. Calvert*: In your opening remarks, Sir Stephen, you stressed the fact that, accompanying an increase of irrigation and of the area under wheat, there had been a decline not only in the quantity but in the quality of exports?—Yes; I did say, if you will recollect, in certain parts, in certain districts of India, not generally.

54,381. The evidence goes to show that there is a considerably increasing demand for wheat for internal consumption?—Yes, that is so.

54,382. That is to say, the demand for internal consumption is offering a higher price than is being offered by the exporters?—That is right.

54,383. Do you think that this higher price for internal consumption is attracting a higher quality, in which case your declining quality may be due to the fact that you are offering a lower price?—I cannot answer that question; I have not been to India for many years.

54,384. It would be natural if you have two demands in one market; one a higher price for internal and the other a lower price for external, that the external should get the lower quality?—It is quite conceivable, but I should not like to offer an opinion.

54,385. With a situation like that, with your export trade declining, what would be the effect of a proposal which has been made to us, that a cess of two annas per cwt. should be levied on wheat exported?—I have never heard of it, but I should think it would kill what little trade remains.

54,386. Assuming that we had elevators for bulk trade in India, what number of grades would the elevator system have to recognise by separate silos?—(*Mr. Pfister.*) It is difficult to say; in the Punjab it could probably be narrowed down to the white and red.

Sir Stephen Demetriadi.

54,387. On the question of encouraging quality, what size of parcel of wheat would have to be offered for export to secure a premium? I think Mr. Taylor mentioned only 1,000 tons of 8A?—(*Mr. Taylor.*) Yes.

54,388. What amount of higher quality can command a higher premium?—On a quantity of 1,000 tons you will begin to get your premium; but you will not begin to get your full premium until the miller is sure he is going to continue getting that quality.

54,389. *The Chairman*: Year by year?—Yes, year by year and month by month. The ordinary Indian wheat, nowadays, is regarded as a fancy wheat; you will not get a higher price until a continuous supply is ensured.

54,390. *Sir Ganga Ram*: Some time ago there was an examination in London of all the wheats in the world, they were given relative marks and Lyallpur wheat was put first?—(*Sir Stephen Demetriadi.*) I have no knowledge of that; it was probably before I interested myself in wheat.

54,391. Do not you think the holding of such examinations periodically is a good method of giving an incentive to cultivators to grow better quality?—(*Mr. Pfister.*) If this wheat, which you refer to as Lyallpur wheat, represented what was currently exported and what the buyer here could always rely on getting, then that would be one thing, but if this Lyallpur wheat was only a sort of fancy crop grown on a particular farm in a special position, then it would be different. (*Sir Stephen Demetriadi.*) If that is so, apparently, it has had a reverse effect; it has not encouraged the Indian wheat trade but has rather done harm to the Indian trade.

54,392. Why?—Because the trade has gone down; the export trade has declined.

54,393. I know it has gone down from 3,000,000 tons to 330,000 tons?—Yes, to something very small.

54,394. Why has it gone down?—I think we have developed that argument, have we not, by saying it is largely due to the fact that India is a larger consumer of wheat itself.

54,395. We grow more wheat now, I think about 10 per cent. more wheat, but the demand inter-provincially is greater?—Yes.

54,396. The inter-provincial people have represented to us that the freight to Karachi is given more favourable terms on the railway, otherwise there would be more inter-provincial trade in wheat. The railway rates to Karachi are more favourable, taking mileage for mileage?—Yes, that is probably true; it is more favourable from the Karachi side.

I may tell you that in the Punjab we are forced to grow American cotton instead of *deshi* cotton, although the proportion of lint in *deshi* cotton has increased, owing to the trouble of picking; I learned, however, only yesterday that an American machine has been invented for picking cotton. The trouble of picking is growing in the Punjab more and more every day because the cost of labour is going up.

54,397. What steps do you think should be taken to increase the export of oil rather than of oilseeds, so that we may keep the oilcake in India for manurial purposes and stimulate the oil-pressing industry in India?—(*Mr. Pfister.*) You are asking us to cut our own throats, but I daresay that process cannot be stopped and that the export of oil from India will increase as more modern methods are adopted.

54,398. It could be stimulated to-morrow; that is why I ask you whether the exporters would help us to stimulate the export of oil rather than of oilseeds?—(*Sir Stephen Demetriadi.*) The reply is no. (*Mr. Pfister.*) There will always be the difficulty in this way, that people will not be willing to buy, here, the oil coming from foreign manufacturers, whether they be in India, France or elsewhere; every crusher thinks he can handle the seed better and produce exactly what is required for his market.

54,399. Because they want to get the cake?—To a great extent, yes.

54,400. That is the only reason why we want to stimulate the oil trader?—Yes.

54,401. Would shipping freights make any difference in the cost?—Of course, you would only pay freight on about one-third the quantity on which you pay freight now.

54,402. But would the shipping companies charge more?—Yes, you can trust them to charge more.

54,403. Two or three years ago, American cotton was largely mixed up with *deshi* the Japanese started it and then your firm followed?—Do you mean the mixing of the seed or of the cotton?

54,404. They mixed two-thirds of one with one-third of the other, of cotton?—I could not tell you.

I am a grower as well as a gin owner; first of all, I refused to sell it in that way, but afterwards I could not help it.

54,405. You now export large quantities of vegetable *ghi* to India, do you not?—Yes.

54,406. I suggest you should put on top of the lids a statement of its composition, so that people would not feel nervous of it in case it might contain beef or anything of that kind?—We do attach a copy of a certificate of chemical analysis showing the exact composition of the *ghi*, or rather, vegetable oil, as we call it; we do not want to use the word "*ghi*" as it might mislead the buyers.

Unfortunately, I must tell you to my own shame and to the shame of the country that we have not used it as *ghi*, but the purchaser uses it more for adulterating pure *ghi*, because he gets more profit in that way.

54,407. We were told yesterday by the Trade Commissioner that in future you will always quote for pure wheat and not for what you used to call "standard" wheat?—(*Sir Stephen Demetriadi.*) Yes that is a change which has taken place many years ago. It used to be sold on an unclean basis but now it is sold on a clean basis. It is nearly 20 years ago that that change took place.

54,408. No, no?—Oh yes, with great respect.

54,409. Pardon me if I say that, within twenty years, I have seen your works in Karachi for mixing mud?—I have no knowledge of them; Mr. Pfister was the manager of our firm in Karachi and you can ask him that question. (*Mr. Pfister.*) Certainly the mixture was added, and it was only when our firm here at this end started an agitation for the clean basis that eventually this was put a stop to; but it took us a considerable time and there was great opposition here at first even from some of the buyers, and without concerted action and bringing everybody in it was no use attempting it.

54,410. Still is it a fact that even now your firms, the exporting firms would prefer buying through the middlemen rather than going to the grower straight?—We do both buy from the cultivator and from the middlemen. (*Sir Stephen Demetriadi.*) The adulteration of which you have been speaking is what I fear may happen in regard to cotton with respect to damping.

It is only two or three years ago that we reported the matter and I think it brought about a law though I cannot say what law.

54,411. *Sir Thomas Middleton*: In referring to Indian wheat, one witness used the expression that all Indian wheat was at present "fancy"?—(*Mr. Taylor.*) Yes, I said it was regarded as a fancy wheat.

54,412. What, precisely, do you mean by this term as it is used at present?—Because it is only obtainable occasionally and sporadically.

54,413. It is the supply that makes it fancy?—Yes, not the quality.

Sir Stephen Demetriadi.

54,414. You also referred to the fact that the best Bombay wheats in pre-War days would compare with Manitoba hard?—No, I do not think that was said; they compared with Australian wheats with regard to quality.

54,415. But not with the Manitoba hard?—No.

54,416. What are the special qualities which distinguished the better wheats of the past?—If you are speaking of the Bombay qualites, it was especially their whiteness.

54,417. And dryness?—Yes, always dry.

54,418. But they had not special strength?—No; there are certain varieties of Indian wheat which we have almost forgotten, which we bought for their value in gluten, but they were not bought in large quantities.

54,419. It was for that reason that they were contrasted with the Manitoba which were much stronger?—Yes, the Manitoba are probably the strongest wheats in the world.

54,420. Your imports are of the Australian type?—Yes.

54,421. Of what nature is the falling off in quality of which you complain? Is it a falling off in flavour or dryness or strength or what?—No, Sir Thomas, in speaking of the falling off I was careful, if I remember rightly, to make it apply more to the Bombay qualities. Those Bombay qualities were those qualities which were regarded as practically the same as those of the Australian wheat, and, as we remarked just now, they were liked so much on account of their pure whiteness. Now, they contain a considerable percentage of red wheat and also of hard wheat.

54,422. Because the higher qualities are consumed locally?—That we do not know.

54,423. That was the presumption; the actual crops are not changed?—(*Sir Stephen Demetriadi.*) I should be surprised to hear that.

54,424. In the Central Provinces?—(*Mr. Taylor.*) We should be more inclined to say that the seed wheat has not been kept pure. (*Sir Stephen Demetriadi.*) We think the quality has deteriorated locally, though we have no knowledge of it. I may develop that argument by saying we sold, two years ago, some Bombay wheats which had certain characteristics. When they arrived here they had not got those characteristics and we had very heavy claims to pay in Italy and here. The Bombay quality has lost its characteristics.

54,425. Had you not bought on sample?—(*Mr. Taylor.*) No, we bought on quality and character. (*Sir Stephen Demetriadi.*) We buy fair average quality of the crop; therefore it does not bear out the view you are holding; we may be wrong, but that is our impression.

54,426. With regard to Karachi does the same hold good?—Not nearly to the same extent; that is why I was making the point that the research department should be under one control, and so preserve uniformity of quality.

54,427. I do not think the departments were operating in those pre-War days?—No, they were just commencing, they were not functioning freely, but we had then the corrective of claims arising which kept it up to its standard; that corrective has gone.

54,428. With regard to Punjab 11, you stated that for a year or two it was classed as superior?—I said it was sold as superior Karachi wheat for about 12 months.

54,429. And then it lost its quality?—No, I did not say that; I said that we had endeavoured to introduce this superior quality, which undoubtedly it was, in the market here. We paid a premium of 9d. per quarter for it; we did not get that premium; we only got 6d., and in course of time the trade died down and did not develop. We did not feel disposed to lose the 3d.

54,430. You are not importing it now?—No. We were probably buying it and mixing it with inferior qualities to tone up our shipments.

54,431. You have no knowledge that that particular class of wheat has deteriorated?—No, I have no reason to think so. There are only 5,000 tons per year available, and that was not sufficient to keep the trade interested in it. The last we heard of it was that there were 5,000 tons in the year.

54,432. *Professor Gangulee*: The selling price has been reduced?—No, I should think if it came into the market to-day it would fetch the same premium as it got when we started to sell it.

54,433. *Sir Thomas Middleton*: What is the particular quality of this Punjab wheat? Is its flavour considered good?—(*Mr. Taylor.*) Not so far as I know; it was clean so far as dirt was concerned, free from barley, and it was wheat of one type only.

54,434. Uniform?—Uniform, one type of wheat only.

54,435. It was not specially strong?—No.

54,436. I am told that the Department of Agriculture have now introduced a stronger wheat than Punjab 11. Reference was made to the import of barley for a short period; that was at a time when barley was selling pretty well in this country?—Yes, that was three years ago, barley was scarce. In pre-War days there used to be a regular business in barley.

54,437. Feeding barley, not brewing barley?—(*Sir Stephen Demetriadi.*) That is quite right.

54,438. There are difficulties in brewing steely Indian barley, are there not?—(*Mr. Taylor.*) I think the brewers' chemists have overcome little difficulties like that.

54,439. *Mr. Noyce*: As you probably know, Sir Stephen, one of the complaints which is most commonly made in regard to the improvement of Indian agriculture is the difficulty of securing for the cultivator a proper premium for any improved variety, whether of cotton, wheat, or any other crop that he grows. What have the big export firms done to help in that direction? Have they done anything?—(*Mr. Pfister.*) All this comes down to the same point: can you rely on a steady supply to interest the consumers here; the consumer will not take up a quality which he can only get occasionally; he must be sure of being able to get the Indian wheat regularly. (*Sir Stephen Demetriadi.*) I think I have partly answered that in the case of Punjab 11 wheat where we did our best to get 9d and not 6d. for it. Give us a regular supply and we will do all we can to encourage the trade in better quality, as we are always ready to do.

54,440. But then are you not working rather in a vicious circle? You cannot get the regular supply unless the cultivator, on his part, is assured of the premium, and you will not give the premium unless you are assured of the regular supply and therefore things go on much as they are?—(*Mr. Pfister.*) On the whole, I think we have generally lost money in attempts to introduce a better quality and I do not think we could do more than we have been doing.

54,441. It is the business of the Agricultural Department and the Co-operative Department to work up a sufficient supply to give you some confidence in its continuity?—(*Sir Stephen Demetriadi.*) Yes, that is right.

54,442. With regard to damping, do you buy any cotton which you do not gin and press under your own supervision?—Yes, and therefore we do trade in damp cotton. (*Mr. Pfister.*) Roughly speaking sixty per cent. of the cotton we buy is pressed and baled already.

54,443. You have really two branches of trade which are competing against each other?—(*Sir Stephen Demetriadi.*) If you like to put it in that way, yes.

54,444. It strikes an outsider that your buyers over here prefer damp cotton, because if they can come to you and be certain of getting it dry,

why do not they buy it dry?—It suggests that a certain amount of damp cotton is not injurious to their trade.

54,445. We know that has always been admitted; but the damping does not usually stop at that; if it is damped at all, it is usually pretty heavily damped?—Yes, that is why I suggested some means according to which a certain percentage of damping which would be admissible would pass under a contract, but anything in excess of that, something inordinately large, would pay a heavy penalty; that might be a way of stopping the undue adulteration of cotton.

54,446. Have you had complaints about the damping of cotton; I mean the part which you do not gin and press yourself?—(*Mr. Pfister.*) No.

54,447. It would seem to imply that you can buy cotton with regard to which these complaints do not arise, if you have no complaints about damping of cotton and sixty per cent. of the cotton you sell is purchased baled?—If we notice a certain discoloration which leads us to suppose that, we do not buy it; but, as I say, a lot of cotton that we do buy has undoubtedly been damped. (*Sir Stephen Demetriadi.*) The very fact that we ourselves do not damp our cotton prevents our getting unduly damp cotton delivered to us; I think that may be taken as being right.

54,448. *Sir Thomas Middleton*: Do your agents not visit the ginneries and see what is going on?—(*Mr. Pfister.*) Yes, they know exactly.

54,449. They know the size of the hosepipe and so on?—Yes.

54,450. *Mr. Noyce*: Under the new Act you can trace the cotton back to the original press or ginnery?—Yes.

54,451. Therefore there is no need for any buyer, who is dissatisfied with the quality of his cotton, ever to buy from that gin or press again?—Yes.

54,452. That should have a considerable effect?—Yes.

54,453. The Indian Cotton Committee recommended the licensing of gins and presses to stop damping, but the Central Cotton Committee did not go so far as that, and this Act under which you can trace the cotton back to its source was as far as they were prepared to go; but you are not quite certain whether it is sufficiently drastic?—I consider it is the only practical way of meeting this difficulty, just to enable the buyer to trace the cotton back to its origin and avoid buying from gins and presses where the damping has been over-done.

54,454. You would not go further and support the Indian Cotton Committee's original recommendation for the licensing of gins and presses?—I do not; I do not think it would be possible to exercise efficient control.

54,455. *Sir Ganga Ram*: The question of elevators has been brought very forcibly before us this year by the railways. You may take it for granted that the growers will not take much advantage of them; I want to ask you whether the exporters will take advantage of them; that is to say, exporters might buy from the growers as they are doing now, grade it, and put it in the elevator at their own risk?—I do not think so; there would be a real difficulty. The exporter would have to supply gunny bags to fetch the wheat in and transport it to the shipping port. Then what is he to do with all these gunnies? He has to re-sell them or use them again at a loss.

54,456. Then it will not be in the interests of exporters to develop this idea?—Not unless it goes right through, if you can handle it in bulk from the interior.

54,457. It will not find favour with the growers?—It will not find favour with exporters either.

54,458. It is our experience that if we send bales through Karachi to Bombay there is a slight increase in weight. How much increase in weight is there from Bombay to London and all these other places? That is all to your advantage, is it not?—I could not say.

54,459. Could you tell me what percentage you gain in that way?—No.

54,460. *The Chairman*: The existing clean terms contract was instituted in 1906 I think?—(*Sir Stephen Demetriadi*): That is right.

54,461. Where mixtures are farinaceous, in nature the first two per cent. is paid for in weight, and a mixture of over two per cent. is paid for at half the contract price?—Yes.

54,462. Does that mean the whole of the admixture including the first two per cent. or the balance over two per cent.?—(*Mr. Taylor*): All farinaceous mixture over the first two per cent. is taken at half price.

54,463. Then in non-farinaceous mixture up to two and a quarter per cent. is deducted from the invoice at contract price, and beyond two and a quarter per cent. the deduction is made at twice the contract price?—That is as it is now.

54,464. Are such standards in vogue in the case of Canadian and American wheat?—No.

54,465. They are practically pure?—Yes.

54,466. Because they have been through the elevators and have been treated in America?—Yes.

54,467. But the effect of the terms of the contract in the case of Indian wheat is that it does not pay to have wheat cleaner than an adulteration proportion of two and a quarter per cent.?—I do not know that that is the case. Most of our shipments, at any rate, are under two per cent. (*Mr. Pfister*): There will still be a saving in freight charges on the dirt under two and a quarter per cent. (*Mr. Taylor*): It is bought with dirt in it owing to the method of harvesting. (*Sir Stephen Demetriadi*): The suggestion is that the harvesting is not a very clean process in India and therefore a certain amount of it must come with dirt, unless it is cleaned first.

54,468. The effect of the contract, I understand now since the last answer, is that if you could produce at the port in London absolutely pure wheat from India, it would pay you to do it; is that the position?—Yes. (*Mr. Taylor*): It is immaterial. (*Sir Stephen Demetriadi*): It would save the freight; it would pay us to do it, because we would not be paying freight on the dirt.

54,469. One last question to clear up the point raised by Sir Ganga Ram. In the case of your own firm at Karachi, is any deliberate adulteration of wheat being carried on at this moment?—I should not think so; there are definite instructions from our firm not to adulterate their wheat.

54,470. *Sir Thomas Middleton*: A question was put to you by Sir Ganga Ram to which I do not quite follow the answer. The question is this: assuming there were in existence, in India, a chain of elevators throughout the wheat-growing areas, would that system be of any value to you as exporters?—None at all.

54,471. *Mr. Calvert*: With railway accessories, wagons and everything?—(*Mr. Taylor*): It would be very slight I think; as things are at present the wheat is shipped, as a rule, within three or four weeks of its being brought from up-country. (*Sir Stephen Demetriadi*): In June and July we want to get the Indian wheat away from India; we do not want to keep it in India. In fact, nowadays, our wires to India are: "At what date can you ship your wheat." June and July is the period during which Indian wheat is wanted; therefore elevators will not help.

54,472. *Sir Thomas Middleton*: A strong point was made of the fact that wheat in elevators was not subject to the same risk from weevils, etc.; that applied only to wheat between August and November, and there is not much wheat available at that period?—No.

54,473. *Sir Ganga Ram*: A strong point was also made, by the Railway Board, of the fact that there is such a rush for wagons in one particular

month; in that case would it not be in your interest to have these elevators, store the wheat and send it at your convenience?—(*Mr. Pfister.*) No, our interest is to get the wheat out of the country as quickly as possible.

54,474. But then you cannot get wagons as soon as you want them because of the demand; that is the reason why the railway are pressing this question?—Unfortunately, during recent years, there have been more wagons than are required. Let the quantities increase again and then we will tackle that question.

54,475. *The Chairman*: You must get your wheat early on to the London market in order to take advantage of the season of shortage?—Yes, and if something could be done to produce a wheat in the Punjab which would come to maturity sooner, that would help matters. Fertilisers might help it. If wheat could be matured, say, in four or five months, it would make the Karachi wheat available at an earlier date. (*Mr. Taylor.*) As the Calcutta wheat used to be; it used to be exported in April; now that has gone out of existence and Karachi is rather late.

(*The witness withdrew.*)

(*The Commission then adjourned till* 10.30 *a.m. on Tuesday, the* 21*st June*, 1927.)

Tuesday, June 21st, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I.	Mr. H. CALVERT, C.I.E., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.	Professor N. GANGULEE.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.	Dr. L. K. HYDER.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.	Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Messrs. VOLKART BROTHERS, London.

Replies to the Questionnaire.

QUESTION 20.—MARKETING.—(*a*) The answer is in the affirmative.

(*b*) The answer is in the affirmative.

The grower sells to the village *sowcar* who probably advanced him money at sowing time. The *sowcar* may, if the quantity is large enough, sell out to native merchants or to European shippers, but the ordinary course would be for the *sowcar* to consign the produce to *artiyas*, who in turn sell to either native merchants or European merchants or shippers.

The remuneration of the *artiya* would be a slender one, not out of proportion to the work rendered. Native merchants may purchase on spec.; there may be a profit or a loss.

The work rendered by the *sowcar*, *artiya* and merchant can be called very efficient and cheaply performed with modest margins of profit, because there is, as a rule, plenty of competition.

The highest initial profit is undoubtedly with the *sowcar*, but then his risks are proportionately high (bad crops, bad debts). The native merchants look to a fair return on the capital laid out on the purchase of produce. Therefore, if the produce is of the description with keeping quality (linseed, wheat, castorseed) he will sit on his purchase for some time until the market comes his way, or the new season promises a plentiful harvest which causes him to sell out in order to reinvest in new crop produce.

The financing of transactions is, as a rule, on a cash payment basis after weighment.

(*c*) We have no suggestions to make, chiefly because it is always a question of price to determine the value of produce in respect of quality, purity, grading or packing. Competition on the part of buyers, both for Indian markets and export markets, is so keen as to rectify shortcomings.

(*d*) The existing news service appears to answer requirements; every market knows, for instance, how cotton futures are opened and closed, and of other produce markets as well.

QUESTION 21.—TARIFFS AND SEA FREIGHTS.—The answer to both (*a*) and (*b*) is in the negative.

Oral Evidence.

54,476. *The Chairman*: Mr. Steiner, you are here representing Messrs. Volkart Bros., of London?—Yes.

54,477. We have your note of evidence before us. Would you like to make any further statement with regard to it at this stage?—I should like to say something about groundnuts in particular. It was not in the Questionnaire, but I see that the scope of your inquiry extends to produce, and I should like to state that every effort should be made to extend the cultivation of groundnuts—not only to extend the area, but to maintain the supply of good seed. It is a well-established fact that groundnuts deteriorate after a few years if grown in the same place with the same seed. I remember, when I went to India in 1897, there used to be a good business in groundnuts from Bombay, but it fell off completely simply because there was no renewal of the seed. Only within the last 15 years has the trade come back. On the Coromandel Coast in the South particularly, the quality of the groundnuts is falling off. They are getting smaller and smaller. In Khandesh, the production has been extended, and a new variety has been introduced which is called the Natal variety. I am of opinion that the groundnut, by reason of its prolific return to the ryot, should receive every attention. There is another point about groundnuts, namely, that there are wet decorticated and dry decorticated. When this business started on the Coromandel Coast everything was wet decorticated. When taken out of the ground, the nuts in shell were steeped in water, and when sufficiently wet the husks were beaten with a stick. Then the kernel separated from the shell. The result, however, was that the oil which came out of these nuts was only fit for soap, and, more often than not, when the nuts arrived in Europe they were simply pieces of cake. In Marseilles, in particular, they were able to make a very good oil. In 1913 or 1914, they commenced shelling these groundnuts by machine in the dry state, and this machine shelling has developed to such an extent that now the bulk of the groundnuts exported from India is of such quality. Those are the nuts which are being used by the margarine people. The free fatty acids of the oil out of such nuts is about five per cent. This groundnut oil, therefore, is just the oil which the margarine people want, but there is a "but" in this. Some of the native shellers and merchants have started wetting these nuts prior to shelling. My firm, in conjunction with other firms, approached the Director of Agriculture in Madras last year in order to put a stop to this practice. At the time nothing was done, but I understand that a few weeks ago enquiries were made on this side as to how the nuts were coming out from the point of view of quality.

54,478. Who made the enquiry?—It must have been a Government enquiry. I think it was an enquiry by the Empire Marketing Board. I would advocate that research should be continued in order to find out new varieties of groundnuts, varieties which give a good return to the grower and which have a very high percentage of oil. There are some nuts which have 49 per cent. of oil; others only have 40 per cent. of oil, and the oil content is the most important item of the nut.

54,479. Does your firm buy groundnuts in countries other than India?—No. We buy only Indian groundnuts.

54,480. Is that because there are no groundnuts in the London market except those coming from India, or is it because your firm is mainly interested in India?—We are a firm of shippers. We buy the produce in India and ship it to Europe. We could buy groundnuts from other countries in the London market, but that would not be our business as shippers. If we did do so, then we should be dealers.

54,481. You are shippers only?—Yes, merchants and shippers.

54,482. You do not handle any produce on commission, do you?—No. Our commission is the difference between the price we pay in India and the price at which we sell in Europe. We do not buy on commission.

54,483. You actually own the produce in the interval between its being exported from India and its being sold in London?—Yes.

54,484. As your business is with India only, you are in competition, in this matter of groundnuts, with produce coming from other countries?—Yes.

54,485. Are the Indian groundnuts holding their own in the British market?—They are.

54,486. So that the deterioration to which you made reference a short while ago has not adversely affected their position in the London market, as compared with groundnuts from other countries?—No.

54,487. How do you account for that?—It is a question of price.

54,488. How does the actual quality of Indian groundnuts compare with that of the Chinese crop?—I estimate that Indian groundnuts are 10s. a ton better value than Chinese.

54,489. Are groundnuts exported from any other country?—Yes, from Nigeria. Nigerian groundnuts are 10s. better than Coromandel.

54,490. That is 20s. difference between the Chinese and the Nigerian?—Yes.

54,491. Nigerian groundnut, at an average price of 10s. above the Coromandel nut, meets a different market, does it?—No, it is the same market. It is for margarine manufacture. Take the big people who buy a lot of these nuts for the purpose of their margarine manufacture. For them, it is simply a question of price. If I offered them Coromandel nuts to-day at £22 a ton, ex-ship Rotterdam, they will tell me, "Your price is 5s. too high because we can buy Nigerian groundnuts at £22 5s. or Chinese nuts at £21 12s. 6d. or East African at £21 15s." The price is based on the oil content and on the quality of the oil. It is all a question of market and price.

54,492. You maintain that, during the period you have known the market, groundnuts from India have held their own?—Yes, particularly during the last four or five years. There was a time, about thirty years ago, when there were practically no groundnuts from India. Then they introduced, on the Coromandel Coast, the Mosambique nut. Then there was another revival of the groundnut-growing industry on the Coromandel Coast, which, at about 1910 or 1912, extended over the Western districts, to the Deccan, Sholapur and to the north.

54,493. Are you familiar with the Indian conditions yourself?—Yes.

54,494. Is it the case that the groundnut is partly a food crop and partly a money crop in many districts?—That is so.

54,495. Part of the crop is consumed by the population?—I would say that part is consumed by the population. It is also sold in order to get food stuffs.

54,496. That is what I meant by a money crop. You know that in some districts the cultivator is actually consuming groundnuts?—Every village has its oil mill.

54,497. What I want to get from you is this, whether the type of groundnut which you, in the London market, regard as the ideal type is also a good type of groundnut for internal consumption by the cultivators in India?—I should think so, because the better the nut and the better the oil, the better it is for eating. It has a sweet taste.

Mr. Steiner.

54,498. Is there anything else as to the preparation, packing, marketing, or quality of groundnut which you wish to mention?—It is always a question of competition. I should like to see better means of communication. The more railways you have the more markets are being created for the produce, not only for export, but for interchange amongst the various parts of India.

54,499. Do you take the view, then, that the market in the immediate future will be capable of taking up an important increase in the groundnut crop of India?—I do.

54,500. Without any serious decline in price?—Yes. Groundnut oil is the most valuable ingredient for margarine.

54,501. There is room for an unlimited amount, is there?—An unlimited amount. It beats everything.

54,502. *Sir Ganga Ram*: In manufacturing margarine, do you use the oil or the kernel?—The oil.

54,503. *The Chairman*: If this decline in quality, which you have described to the Commission, continues, will it ultimately threaten the position of Indian groundnuts in the world's markets?—I feel certain that that decline in quality will not be continued. Every year we are getting samples of new varieties from India which show that the agricultural farms are busy trying to improve the strain of the nuts. It is only the malpractices of some people which has given the Coromandel groundnuts a bad name. There is another point. If there is a season with a good monsoon, if there is a timely monsoon, the quality of the nuts is very good. If there is a season with untimely rain, if the rain comes down when the nuts are out of the ground, then the quality will be bad; it cannot be helped.

54,504. Will you tell the Commission, quite shortly, the scope of your firm's business. What produce do you deal in apart from groundnuts?—Principally in cotton and castor seed, cotton seed, linseed, copra, pepper, coffee, fibres, and everything that India exports.

54,505. Wheat?—No.

54,506. Practically the whole range of produce except wheat?—Yes.

54,507. Do you deal in rice?—No. That is a Burma commodity, and we are not established in Burma.

54,508. In the case of all these various kinds of produce, your firm acts as merchants and shippers?—We buy the produce in India from the people there who grow it or who deal in it, middlemen in India, and we sell it to Europe.

54,509. Have you storage at both ends?—We have big storage in India.

54,510. And in Europe?—No. You can rent it in Europe much more cheaply. There is no need to hold storage on this side.

54,511. Do you ship from Calcutta?—Only hides, no other produce.

54,512. Have you any views as to the effect of the deferred rebate system on freight rates?—Bombay is a free market in that respect.

54,513. That is why I asked you if you shipped from Calcutta?—I had a lot to do with that. I think a deferred rebate affects trade in wheat and in big bulk commodities, but not in commodities of great value. A conference would do no good for the Coromandel Coast for groundnuts; neither would it be any good for Bombay or for Karachi. It could not be kept up because, there, the merchants are too strong.

54,514. The merchants, as a whole, are opposeed to the rebate system, are they not?—Yes. It restricts their freedom. I will quote an instance from Colombo. Last summer, there was a conference which kept the rate at 40s. a ton when, on the Coromandel Coast, at the same time we were chartering steamers, and liners were taking freight, at 17s. 6d. a ton. The result was that the trade of Ceylon was upset.

54,515. Have you personal experience of buying these various lines of produce in India?—Yes.

54,516. Where did you buy as a rule, at the large centres or in the small towns?—I have bought in Bombay, Cawnpore, Agra, Madras, Pondicherry, and so on. Those are the principal places I have been to. We have about 250 buying agencies in India.

54,517. Do your buying agencies in any case come into direct touch with the cultivator?—Yes, very often.

54,518. Is that a satisfactory arrangement?—It is, in a way. If you deal direct with the cultivator you get a smaller quantity. Instead of buying 50 tons or 100 tons at one stroke, you buy from these men two cartloads or three cartloads or one cartload. But I find it is a better system because you get the real quality if you buy from the individual man. You can look at the goods if you are buying one cartload of linseed, or whatever it may be. There it is in front of you. Whereas, if you buy 50 tons you cannot see the whole lot; it is impossible.

54,519. Do you regard the marketing arrangements as a whole, which you have met with in India, as efficient?—I do. The Indian is wide awake. We cannot teach him anything.

54,520. Do you regard the marketing as orderly?—Yes. I am quite satisfied in that respect. I have only happy memories of my experience of India in that respect.

54,521. I thought you were going to tell the Commission that some of your experiences had been unhappy?—No. Where the disappointment comes in, in our line, it is if you make forward contracts with a man. You buy forward for delivery in two or three months, and if the market goes up the man will not deliver. If I buy from the cultivator a cartload here and there, then I have got what I want. He comes with the stuff, I pay him out, I have the goods there, and everything is satisfactory. That is what I like.

54,522. Would you agree that orderly marketing has a most important effect in educating the cultivator as to the value of quality?—Yes.

54,523. Do you think that the Indian cultivator receives an adequate premium for quality?—He does, because if I do not pay the price another firm's man will pay it, or some native merchant will pay it. That is competition. We have not got it all our own way in India. There are always four or five buyers who play one against the other. Sellers may combine, but buyers cannot combine.

54,524. *Dr. Hyder*: But buyers are few and sellers are many, and the buyer can combine more easily than can the good many sellers?—But we must have the goods. Otherwise what would be the object of our going to a certain market, when we could just wait in Bombay until the produce came down? One reason why we go inland is for the quality, particularly in cotton. If we buy at the place where the cotton is grown, we know we shall get the right quality.

54,525. *The Chairman*: Following on the last question, you suggest that the cultivator does receive value for quality, speaking broadly. Is it the case that an important proportion of the cultivators in India are deep in debt?—I am afraid they are.

54,526. And when a cultivator is deep in debt, is he a free agent in the matter of selling his produce, or is he, in most cases, tied to the man who has lent him money?—More often than not, the sale of the produce goes through the man who has advanced the money.

54,527. And he cancels a certain amount of the debt?—That is an internal arrangement. If a man borrows money at seedtime the first thing he has to do when he has sold his produce is to liquidate his debt, and in his anxiety to liquidate his debt it is only human nature that he may be "done in the eye" when the price is being fixed.

54,528. He would be more likely to be "done in the eye," as you term it, in selling to the *sowcar*, who is fixing the price and cancelling a certain

amount of his debt, than he would be in the case of a sale effected in an open market, would he not?—Yes. Let us take a sale in the open market. There is a whole crowd of twenty-five or thirty men who can protect him. Supposing he is a weak-minded man, if the buyer attempted to sit upon him, his fellow villagers round about him would say, "Do not do it."

54,529. What trade organisation have you in London which could bring to the notice of Governments and of the Agricultural Departments in India complaints as to the quality of produce? Have you any such organisation?—Yes. We have the East Indian Shippers' Association.

54,530. Take the case of the complaints relative to the quality of groundnuts which you made. Were those complaints conveyed through a Society or from yourselves as a firm?—That was done in India. It emanated from Guntakul in the Western districts.

54,531. Have you ever come into contact with the Indian Trade Commissioner?—Yes. We answer enquiries and give information if asked.

54,532. Do you know his name?—I know Mr. Asli. That is the gentleman with whom I have been dealing at the Indian Trade Commissioner's Office.

54,533. *Professor Gangulee*: What sort of information do you seek from the Trade Commissioner's office which you cannot get from your own branches in India?—We get all the information we want from our own people. There is no need for us to go to the Trade Commissioner. We consider ourselves privileged to reply to enquiries addressed to us, and we gladly supply information which he wants.

54,534. With regard to these free fatty acids: was that information transmitted by the Empire Marketing Board to the trade?—That information was transmitted through our own people in India. We write to them every mail, and we also cable. We keep them posted as to what is going on. We tell them what should be done and what should not be done.

54,535. *The Chairman*: I take it that, in the case of an old-established firm such as your own, you have ample correspondents and agencies throughout the East to find out all you want to find out, but that might not apply to firms of lesser standing. Is that the position?—I find London a very good place in which to get information. In the trade circles in London I often get to hear things of which my people in India do not know. They get it from me. Again, I get to know about things that they have done, but about which they have not told me. It is a wonderful place, is London, in which to gather information.

54,536. Would you like to say anything about any other particular line of produce, oil seeds for instance?—The export of Malabar copra has practically ceased owing to the introduction of the 15 per cent. import duty. I do not know whether it is within the scope of the Commission to recommend that that duty should be re-considered.

54,537. *Professor Gangulee*: You say it is an import duty?—Yes. We want to export more copra from India.

54,538. The duty is an export one then?—No, it is an import duty on copra from Ceylon. You are narrowing the market for Malabar copra. For Indian consumption, you get Ceylon copra, which answers the purpose just as well as Malabar copra. I think it would be a better thing to import Ceylon copra and export the Malabar copra, because the Malabar copra commands a much better price in the world's market than does Ceylon copra.

54,539. *Mr. Noyce*: When was that duty imposed?—About four or five years ago. India used to buy cocoanut oil from Ceylon and export the copra and oil at a profit.

54,540. *The Chairman*: Is it your suggestion that the effect of the duty on copra coming from Ceylon to India is to produce a consumption of Malabar copra in India which otherwise would be exported?—Yes. When the duty

was imposed, the effect it would have on the Malabar copra was probably not thought of at all.

54,541. Surely the world price is still ruling Malabar copra! Why is not the export continuing? Perhaps I have not understood your argument?—By introducing the duty, Cochin copra has been protected. Formerly, Ceylon used to ship copra to Calcutta and to Karachi. Now, the copra is shipped from Cochin to Karachi and from Cochin to Calcutta. The freight from those ports, from Cochin to Karachi and from Cochin to Calcutta, is higher than from Colombo to Karachi or from Colombo to Calcutta. The same happens with oil: Formerly coconut oil was shipped from Ceylon to Calcutta and from Ceylon to Karachi and from Ceylon to Bombay. Now the coconut oil is shipped from Cochin to Bombay, Karachi and Calcutta, and costs ever so much more.

54,542. Do you deal in hemp?—No.

54,543. Nor in jute?—No. We are only in Calcutta for cotton and sugar.

54,544. Do you deal in tobacco?—No.

54,545. Do you deal in spice and ginger, and so on?—Yes. We are leading shippers on the Malabar coast.

54,546. Is the quality being maintained there?—Yes. There is no complaint in that respect. They do not grow enough.

54,547. Would the price fall if they did?—No, not seriously.

54,548. Are there any other lines of produce as to which you would like to speak?—Not produce exactly, but I would like to comment on the market reports. At present, the Government of India is issuing forecasts of coming crops, and also final reports. A distinction should be made between the quantities available for export and the quantities used for home consumption. I have often found that these reports have had a misleading influence on the markets on this side. For instance, if a forecast is published in India, it is cabled over; it appears in the trade papers on this side; they say, e.g., the groundnut crop will be 1,300,000 tons. That has an adverse influence on the market at once. People say, "Ah! look at this vast quantity of groundnuts which is coming," and it spoils the market for a considerable time. It should be stated that while 1,300,000 tons is the total crop, there would be available for export, say, 600,000 tons. That would clear away all doubt, and it would increase the value of the reports. It is curious how people always believe the "bear's" arguments and how very slow they are to follow the "bull's" argument. When people are told that the monsoon is scanty, they take a very long time to be convinced about it, but the moment the "Times" reports heavy rainfall in Bombay they say, "Ah, a good monsoon; now the price must come down."

54,549. To what do you attribute the tendency of the market to pay more heed to bad news than to good news? Is it human nature, or experience?—It is human nature. I know that many times it has spoiled my business.

54,550. *Sir Henry Lawrence*: From what part of India do you draw your groundnuts chiefly?—From Madras and the Deccan and Khandesh.

54,551. You are satisfied that the Agricultural Departments are doing good work in improving the quality, are you?—Yes, quite satisfied. They do all they can.

54,552. Which variety of groundnut is the best from your point of view?—Mosambique is the standing quality. Now, there is a new quality called the Natal nuts.

54,553. Do you know which variety of groundnuts is cultivated most at the present time in the Bombay Deccan?—I cannot answer that. I have a suspicion that the best nuts are not shipped, but are consumed in India for eating. I happen to be on the Committee of the Incorporated East India Association, which has all the samples of every shipment of Indian groundnuts submitted to it. I have seen some very good samples, some indifferent samples and bad samples. Considering the fact that more than what is

shipped is consumed in India, I cannot help thinking that some of the best nuts are kept there.

54,554. When you buy a cartload of nuts, do you pay a different price according to whether they are Japanese or Spanish or Natal?—That would be done, but when you buy the nuts it would be the admixture of dirt which would tell rather than the quality itself. Some of these people are in the habit of putting more dirt into it than others.

54,555. *The Chairman*: But they all put some in, do they? Is it a deliberate admixture?—It may not always be deliberate, because, in some cases, when you pull the nuts out of the ground some soil may stick to them. Occasionally, however, deliberate attempts are made to put mud into them in order to get something for nothing.

54,556. *Professor Gangulee*: By the cultivator or by the middlemen?—Both by the cultivator and by the middlemen; they are all the same.

54,557. *Sir Henry Lawrence*: The extension of the area under these nuts depends a great deal on the actual growing quality and the habit of the nut, does it not?—Yes, and on teaching the cultivator. Nuts are now being grown on the Bombay side, where they were not grown before. Khandesh has produced, during the last four years, increasingly large quantities of nuts of a very good variety and full of oil. I believe attempts are being made to extend the cultivation in Gujerat, and perhaps on the Karachi side. That may come about later on in the newly irrigated tracts.

54,558. You sell your shipments in Europe, chiefly in France, do you not?—We sell them anywhere. We sell them to the United Kingdom and to France and to Holland and to Italy. Holland is a particularly big buyer.

54,559. The consumption in France is five times as great as that in the United Kingdom, is it not?—I do not think France is the biggest buyer of groundnuts. Holland is one of the biggest buyers now.

54,560. According to the statistics given in the book I have before me, the consumption in France is five times as great as that in the United Kingdom?—For what year is that?

54,561. They are comparative years from 1915 to 1925?—Things have changed since 1925. Last year, France took very much less Indian groundnuts than ever before, because of exchange troubles. They took the nuts from their own French colony of Senegal, because there was no exchange risk.

54,562. *Sir Ganga Ram*: You are agents for implements also, are you not?—Yes.

54,563. Are they British-made or American-made implements?—We are agents for one British firm, and we have now been agents for the International Harvester Company, in India, for the last two months.

54,564. In connection with these implements, cannot you start some hire purchase system? At present, it is not within the means of the ordinary cultivator to use these implements owing to their high price?—That would mean that we would have to be a sort of banker. As it is, we merely buy goods and sell goods. A hire purchase system might be carried out by the co-operative societies; it would be their business and not that of the merchants. Of course it would enhance the cost of the goods. If we had to sell on the hire purchase system, naturally we would charge for it in the price.

54,565. Is the difference in quality, which you have mentioned, due to new methods of cultivation or to the new seed?—It is due to the seed.

54,566. Cannot you import good seed and give it to the ryots?—That would be going too far, I think. A native grower likes to talk with us and he likes to deal with us, but when once you begin talking to him about his husbandry he says "Hands off; that is my business." It is the business of the Government officials, of the Collector, of the revenue officials. They can do that kind of thing much better than a merchant.

They have influence with the people. We are free lances, and we cannot influence them.

54,567. What sort of protection do you give the nut, because my experience is that it is very liable to attacks from worms and weevils? How do you avoid that?—We do not shell the nuts until we have to ship them. If you keep the groundnuts in the shell the weevil will not get into them, not so easily; but the moment you have shelled the nuts, away goes that protection. Then you must ship them, because, particularly in damp weather, maggots and weevils will develop and spoil the quality.

54,568. You know that, during growing time, the stem is very liable to disease and that that is the reason why, in the Punjab district, we have given up the cultivation of groundnuts?—Is that so? I have often wondered why they did not take up the cultivation of groundnuts there.

54,569. We tried to, and we used to get a very good return, but at the time of ripening the stem was attacked by white ants?—That is most interesting.

54,570. Would you co-operate with us in producing oil instead of groundnuts?—I suppose we would. Why not? Business is business.

54,571. Is not the vegetable *ghi* that you are sending to India from Holland mixed with groundnut oil?—Yes. That is the main ingredient. That is the good thing which is wanted.

54,572. When you buy forward, do you advance any money?—No. We must not do that. That is a strict rule.

54,573. *The Chairman*: Whose rule is that?—The Head Office's rule. It may have been done in a weak moment, but it must not be done.

54,574. *Sir Ganga Ram*: Do you think the heavy duty which has been put on imported sugar has reduced the import?—I do not think so.

54,575. I thought that, even after the tariff, they had begun selling it cheaper than before the tariff?—It is the world's market for sugar. It is chiefly regulated by Cuban sugar and by the beet sugar of Europe. The crops have been heavy. The supply is bigger than the demand. The consequence is that prices have come down and the import duty has had no effect.

54,576. You generally import cane sugar do you not?—Yes.

54,577. Not beet sugar?—When the price is right we import beet sugar.

54,578. *Sir Thomas Middleton*: Apart from the percentage of oil and the admixture of dirt, what other factors affect the price of the goundnuts which you buy from different countries?—The price of cake.

54,579. As between the groundnuts of different countries, can you detect any difference in the tendency to go rancid on the voyage?—No. It is a question of shelling. There is a fine brown skin round the kernel. If that skin is left intact, then the kernal will not suffer at all, but if that fine skin is removed then, of course, acidity sets in.

54,580. You have told us that your practice was sometimes to buy cartloads of selected produce direct from the cultivator. Is it your impression, that the selected crop was generally in the hands of the cultivator, or in the hands of the *sowcar*?—It was in the hands of the *sowcar* more often than not I am afraid.

54,581. *Professor Gangulee*: With regard to your criticism of the Government Reports, how can the Government make an estimate of the export demand without knowing, for instance, the crops coming from Africa?—They should state that the estimated yield of crop is so much; that the estimated exportable surplus is so much, and then in brackets "This figure is based on last year's shipment."

54,582. *Dr. Hyder*: Do not you think the "bears" in the London market would be annoyed with the Government of India for issuing that?—Let them be annoyed; I should not worry about that.

Mr. Steiner.

54,583. *Mr. Noyce*: Arising out of your last answer, is not the trade here in a position to work out the figures of the quantity available for export and for home consumption for itself? You have exactly the information as the Government of India have?—Of course we have, and we have it much earlier.

54,584. What is the object, then, of the Government of India stating it in the forecast, if you are in a position to work it out for yourselves?—We are interested parties.

54,585. I am not referring specially to your firm, but to any one interested?—We all have our own Statistical Departments. The only figure we have not got is the acreage in India. That is the unknown quantity. We have to go upon what happened last year. Last year the price for groundnuts was good. It stands to reason that this year the cultivator will again plant groundnuts. If the price had been bad last season the cultivator would naturally say "I am not going to plant any more groundnuts; I am going to plant cotton." That is the general assumption we go upon. For instance, we estimate the crop to be a twenty-anna crop if there has been general rain all over the country. People will say "There will be a bumper crop now. Last year the export of groundnuts was 600,000 tons. This year we may estimate that the exportable surplus will be 720,000 tons, 120,000 tons more." That is an important item in the market. If, on the other hand, there is a scantiness of rainfall, and we see from the weather charts that the sowings may not be successful, then we say there may be 150,000 tons less, a twelve-anna crop; and we operate accordingly.

54,586. *Dr. Hyder*: Has there been any change in the method of doing business? I understand you are now trading without stocks, whereas, in 1914, the trade always carried large stocks, which had a steadying influence on the market price?—One change has occurred in the business, namely, that the buying on this side is concentrated now in about three or four hands instead of about fifteen or twenty in pre-War days. The margarine manufacturers have, more or less, combined. We call it a combine. Formerly we used to do business in parcels of two hundred tons at a time. Now we do business at one to two thousand tons at a time. Formerly, we were able to sell here and buy simultaneously in India at some if only a small profit. Now, we have to take what we call a "view." We have to go either long or short. If we think the market warrants higher prices, that it will go up for one reason or another, we continue buying in India, at, say, 10*s.* above the price we can get on this side, waiting for this market to come up, which may happen in a fortnight or three weeks or a month. On the other hand, it may not happen and then we have to take our loss. If we think that markets in India are likely to go down we may ask our buyers "What is your price," and we may go short. We may sell to them. They say "We want to buy 1,000 tons at £22." We say "Very well you shall have it." This is, say, for July/August shipment. We have time to buy until the middle of August, and we wait for the Indian market to come down. If it comes down to £22 we buy it. We have done the business and we have made the turnover. If the market does not come down we have to cover at a loss. We have to carry big stocks in India. At times, we carry a stock of groundnuts of 5,000 or 6,000 tons. Formerly we did not do that. Now we have "to carry the baby all the while" as it is called in the market, and it requires a lot of finance.

54,587. I thought the merchants of Europe were rationalising their business; that is to say, not carrying any risks but depending upon the circumstances?—We wish we could do the same. In our trade in cotton

and seeds we have to take a "view." We have either to carry a big stock in the hope of selling it when the price comes right, or to go short hoping to cover later on.

54,588. *Sir James MacKenna*: Have you had any experience of the small Japanese groundnut, the one that grows above the ground instead of under it?—No, I have not.

54,589. With reference to machinery, I think your firm for a number of years acted as agents for Messrs. Wallace Brothers, Glasgow, for reapers?—We are still agents.

54,590. What has happened to that experiment?—We are still the agents at Lyallpur.

54,591 Is any business being done?—Yes, a steady business; we are carrying on the Wallace business alongside that of the American concern, namely, the International Harvester Company of Chicago.

54,592. The early years were somewhat trying to both of you?—Yes.

54,593. What are your views as to the export duty on hides?—That was a grievous disappointment; it was abolished and then re-introduced again the next day so to say. It should be abolished.

54,594. Is it your view that, if the import duty on Ceylon copra were abolished, the Malabar Coast would import Ceylon copra, and then you could export the Malabar stuff?—Yes, my view is that Bombay would import Ceylon copra, and Malabar instead of shipping that copra to Bombay and Calcutta, would ship it to Europe.

54,595. Would that be to the mutual advantage of both places?—I think so.

54,596. Are you quite sure that, in these forecasts, home consumption is not taken into consideration?—Yes, it is taken into consideration; that is what makes the figures so big. I am speaking now from memory: I think the Government forecast talks about 1,300,000 tons of groundnuts.

54,597. That is the total production?—Yes, and the shipments are roughly 600,000 tons from all ports.

54,598. Do you think it would be easy to estimate the internal consumption of things like groundnuts and non-food crops?—I do not think it could be done exactly; it is too big.

54,599. It would be very difficult?—It is too big a thing.

54,600. But still, you think there might be an approximate estimate?—Yes, that is right.

54,601. Of course, in the case of rice and wheat they can get very near it, as you know?—Yes.

54,602. *Professor Gangulee*: Following up that last answer, are these crop forecasts of any assistance to you in your trade, as they are now?—No.

54,603. They are of no assistance to you?—No, because we have our own Statistical Department.

54,604. *Mr. Noyce*: You can only get the acreage from the crop forecasts; your Statistical Department cannot give you figures of acreages?—No, but we work backwards from the shipments and on the rainfall, and then we have men travelling all over the place to find out.

54,605. That is as regards conditions; my point is that you are dependent on the Government crop forecasts for your figures of acreage, and therefore they must be of some use to you?—As I say, we go on what they say, whether it is going to be a 20 annas crop or a 12 annas crop; that is what our basis is, because we realise that even the Government officials, with all their power and might behind them, get their information through so many channels that their figures cannot be absolutely reliable; I mean, with a country iike India it is impossible to have things

cut and dry; it is not like America; it is not like a country with a big railway system and all that; we know what India is.

54,606. I quite understand that, but my point is that your Statistical Department has no figures of acreage except those it gets from Government?—No, we could not have any other.

54,607. After all, the figures of acreage are a very important factor in the crop forecasts, and therefore, to that extent, the Government estimate must be of some use to you, because those are the only figures you have of acreage?—What is of importance to us is the rainfall; we can take it in India that the acreage is about the same. If you take a village, the village will plant what it can plant, year in and year out; it is just a question of what it can plant. But what influences the size of the crop is the rainfall; timely rainfall makes all the difference. In a given place with a scanty rainfall we may have perhaps a 6 or 8 annas crop, while with a good rainfall you may have a 24 annas crop. Then the other item comes in: well irrigation. I am afraid I cannot quite agree with what you say as to the acreage. It is quite interesting to show the acreage position for the sake of comparison with a previous year, but I think it is the rainfall which is the factor.

54,608. *Sir Thomas Middleton*: May we take it that your Statistical Department pays very little attention to acreage figures?—They study them very, very carefully;; there is no doubt about it. I am talking now heart to heart; we have always got to learn, you see.

54,609. *Professor Gangulee*: Do you sell groundnuts on the basis of oil content?—No, not yet.

54,610. What is the basis of the contract that you enter into with the consumer?—We sell sound delivered; that means we guarantee to deliver sound stuff, of fair average quality of the season, time and place of shipment.

54,611. On the basis of a particular sample?—No. The procedure is like this: All the samples of each and every month are collected and sent to London to the Incorporated Oil Seed Association. Then a Committee meets which inspects all the samples and decides as to whether the quality is the right quality for a particular standard; some samples will pass into the standard and some will be rejected being not fit to go into the standard.

54,612. How do you settle that standard: on the percentage of oil content?—No, on the outward appearance of the nuts.

54,613. *The Chairman*: Then, is the purpose of that committee to fix a standard which is known as "Fair Average Quality" for that particular season?—Yes; for a particular month; and then on all these shipments the buyer compares his shipment with the standard sample, and if he considers his shipment not equal to the standard an allowance will be claimed.

54,614. *Professor Gangulee*: The consumer is chiefly interested in the oil content?—Yes.

54,615. Therefore, suppose, in India, we evolve a type of groundnut with a high percentage of groundnut oil; will it not make any appreciable difference in its market price?—It will. There is now one variety which yields about two per cent. more oil than the ordinary Coromandel; our firm has been selling that special variety to the Marseilles market, where they obtain two per cent. better price because the crushers in Marseilles realise that there is more oil in it.

54,616. So that there is the prospect, if we, in India, can produce a quality of oil-seed with high oil content, it will get a better price?—Yes, it can be done.

54,617. Is Indian production stationary?—I should say it is increasing, but at the same time, I must say that Indian home consumption seems to increase.

54,618. *The Chairman*: So that the export largely remains stationary?—Yes, the crops get bigger, but somehow or other there seems to be more money in India to buy the oil; the standard of living seems to be higher than formerly.

54,619. *Professor Gangulee*: Your idea is that production is stationary but the variation comes in export?—No, the production is on the upward grade, but what is available for export remains stationary.

54,620. Does the trade in groundnuts suffer very severe fluctuations in prices?—At times it does, yes.

54,621. I think you have told the Chairman that the prices of the Indian varieties are about 10s. more than the Chinese?—Yes.

54,622. That is this year?—Yes.

54,623. For example, I find that the January figure of the sale of groundnuts on the London market in 1926 is £20 3s. 9d.?—Yes, Coromandel.

54,624. While the Chinese variety was being sold in the London market, in January, 1926, at £22 5s.; that is £2 1s. 9d. more?—There may have been a corner; there may be an exceptional state of things.

54,625. But then again in this year, in February, 1927, the Indian groundnuts commanded the price of £23 in the London market, whereas the Chinese price was £21 15s.?—Yes, I will tell you why. The quality of this year's Chinese crops is very bad indeed; there have been allowances of 25, 30 or 40 per cent. on shipments. The Chinese groundnuts of this season are not fit for edible oils, but only for soap oils. Last year, the quality of the Coromandel groundnuts was bad; (it was a big crop; the big crop was on account of the heavy rains we had in December and January) the result was that the proportion of free fatty acids of the oil obtained from the Coromandel groundnuts was very high, whereas the Chinese groundnuts of last year were very good quality; hence the abnormal difference in price.

54,626. In your London market, untreated groundnuts are regularly quoted?—Yes.

54,627. I mean not decorticated?—Yes; those are West Africans; the groundnuts from India are all shelled.

54,628. Will you tell the Commission if you have any suggestions with regard to the packing of decorticated nuts? In view of the proportion of fatty acids, do you think any improvement can be effected in the method of packing the decorticated nuts?—I do not think so; a nut which is good in India will stand the journey home all right. If the nuts are found to be of bad quality here, it means that the nuts were bad in India already.

54,629. With regard to your business in India, do you employ your own brokers for buying your produce?—You mean house brokers?

54,630. Yes, house brokers, as they are called?—Yes, at every place we have our own broker.

54,631. Recently of course, as you know, the development of the co-operative movement in India has been proceeding apace: how would you view the further expansion of the co-operative marketing organisations in India?—I think it would only mean that, instead of buying from the individual man, we could buy what is produced by half a dozen or a dozen men.

54,632. Do you think that would be advantageous?—It would facilitate matters; instead of buying retail, we might buy a bit wholesale; instead of buying one or two carts we should get about twelve or fifteen.

Mr. Steiner.

54,633. Just as you said in answer to Mr. Noyce that the consumers at this end have combined, it is necessary for the producers at the other end of the chain also to combine?—You can say that the producers' shippers should combine.

54,634. *The Chairman*: Do not they?—How can they? I put it to you: suppose we buy 100,000 or 200,000 tons of groundnut: the consumers can just keep away from the market, and what are we then going to do with the nuts? No, it cannot be done.

54,635. *Professor Gangulee*: You say "The existing news service appears to answer requirements." Do the actual growers obtain the necessary information about the market?—What they do not know about the market is not worth knowing; they know about home markets in the early morning. I do not know how the news gets about, but anyhow Reuter's cables go all over the place.

54,636. Do you think that, for the requirements of the London market, adequate attention is given to Indian products by the Empire Marketing Board in their publicity work?—Do you mean in connection with the India Office?

54,637. No. There is a Board known as the Empire Marketing Board: do they publish the necessary information regarding Indian products for the markets here?—I could not answer that.

54,638. I want to know whether Indian products are properly advertised in the London market?—Yes. Indian products do not require advertisement in that sense.

54,639. Apparently, products from New Zealand and Canada require advertisement?—Those are new countries, but Indian products are known and do not require any advertisement.

54,640. Are you familiar with the publicity work of the Empire Marketing Board?—Yes, I have heard of it, but I do not think I have heard of it in connection with India.

54,641. *Sir Ganga Ram*: Do you often cover your risks by making a one-sided contract with the sellers, that is to say that the offer is open for 24 hours; have you often done that?—Yes, of course. Formerly one used to get firm offers and try to sell the goods; if the sale went through we accepted it.

54,642. Do you export cashew nuts?—Yes.

54,643. Do you export walnuts?—No.

54,644. Do you export any other kinds of nuts?—No.

54,645. *The Chairman*: How comes it that untreated Indian nuts are not regularly quoted on the London market?—You mean unshelled?

54,646. Yes?—India does not ship any nuts unshelled; they are all shelled. There is no trade for unshelled nuts. The only nuts that come in shells are the West African and the Sudanese.

54,647. There would be no advantage in initiating a trade in unshelled nuts?—No, there has never been any demand for it. We used to ship some from India to the Red Sea ports for edible purposes.

54,648. I ought to have asked you whether you wished to say anything about agricultural implements. I understand your firm does a certain business in agricultural implements?—Yes, our firm has been for years representing Wallace Brothers in agricultural implements, at Lyallpur, and in April last, I think it was, we were appointed agents of the International Harvester Company, a big American concern.

54,649. You are not manufacturers?—No, we are not manufacturers, we are only merchants.

54,650. You do a trade in spare parts?—Yes, that goes with it.

54,651. Have you depots for special parts and repairs?—Lyallpur is the head place.

54,652. But do you cater for repairs?—I could not say.

54,653. You are not familiar with that?—That is one of the details I have nothing to do with.

(*The witness withdrew.*)

APPENDIX.

Castorseed.—The total exports during the calendar year 1926 from India were as follows:—

	Tons.
United States of America	43,370
United Kingdom	25,341
France	15,395
Belgium	5,435
Italy	9,380
Spain	1,897
Other countries	2,460
Total	103,278

The United States of America are heading the list as buyers of Indian castorseed. This is exceptional, as in former seasons the United Kingdom used to be the chief buyer. The crushing of castorseed in the United Kingdom is concentrated at Hull. Castor oil is used to some extent for lubricating aeroplanes, which use is, comparatively speaking, of recent date. The bulk of castor oil is used by Lancashire, where it is employed by cotton dyers and printers. The great demand for castorseed from the United States of America may be attributed not only to the requirements of the Flying Service, but also for industrial purposes like the manufacture of artificial leather used for the upholstering of motor cars, &c.

Linseed.—The falling off of shipments of Indian linseed may be attributed to increased consumption of linseed oil in India itself. There are places in India where linseed oil fresh from the press is used as an edible oil.

As to qualities of Indian linseed, there is:—

(*a*) "Bombay Bold" linseed, the product of the United Provinces, the Berars, Khandesh and parts of the Nizam's Dominions.

(*b*) "Small" linseed, which is shipped either from Bombay or from Calcutta. It is grown in the neighbourhood of Gaya, and it is a question of sea freight, principally, whether the seed is sent to Bombay or Calcutta for shipment.

(*c*) "*Bigarre*" linseed or "*Kabri*" linseed, which is a linseed of more or less percentage of yellow grains. This is considered the best linseed going, and of recent years very little has been shipped from India, presumably as it is very suitable for making of edible oils locally.

In Rajputana Malwa, a linseed of extraordinary bold grain is grown, which is also chiefly used for inland consumption.

Cottonseed.—It is remarkable that Broach cottonseed is not liked on this side on account of its low oil content, whereas Broach cotton is one of the

best. On the other hand, Berar cottonseed, which is well liked by English crushers, and which is the seed they would like to have, is also in good demand on the part of Indian consumers, chiefly for direct feeding to the cattle; in other words, the oil is not extracted.

Punjab-American cottonseed 4F type produces a seed which is well liked by crushers in England, but the inland consumption of this seed is steadily increasing now that the prejudice on the part of Indian buyers against this black cottonseed has been overcome.

Gingellyseed or *Tilseed* has been steadily losing ground as a seed exported from India. It is a precarious crop from the growers' point of view, and it enjoys a ready sale in India to local oilmongers.

Mr. J. E. FROST, Director, the British Oil & Cake Mills, Limited.

NOTE ON INDIAN OILSEEDS.

I beg to outline below the points I would venture to touch upon in regard to Indian oilseeds.

Generally my experience in transactions affecting Indian oleaginous products is satisfactory, the business being conducted on this side by firms of the highest standing, who carry out their contracts both in the spirit and the letter; consequently I have no recommendations to make in regard to marketing methods in the United Kingdom. Furthermore, cases of dispute or questions of quality are satisfactorily dealt with through the medium of the Incorporated Oil Seed Association, under whose rules and regulations the transactions are conducted.

Dealing particularly with the various articles, my Company purchase:—

Linseed.—Indian descriptions retain uniformity of quality from year to year and are preferred by us to linseed of any other origin; being now sold on pure basis, the former rather heavy admixture of dirt, &c., is reduced to a minimum. It is regrettable that the quantity exported annually from India appears to be declining.

Cotton-seed.—There is considerable difference in quality. Karachi is always superior, especially the "Black," for which a market is assured. From Bombay, the quality known as "Bombay" is good, but there is a tendency to mix inferior seed such as Broach and Coromandel, with the Bombay, which leads to dissatisfaction and claims on this side. Further, we frequently find considerable admixture of dirt, iron and needles, the latter being a great nuisance and dangerous, as our magnets are not so efficient with cotton-seed as with other seeds, and any small and sharp pieces of iron or steel get into the cakes and lead to claims against us for losses of cattle, &c. In this respect, Indian cotton-seed compares badly with Egyptian, Sudanese, &c.

Groundnuts.—On the whole, the quality is improving, inasmuch as machine-shelling is becoming more general. Coromandel are preferred to Bombay, but there is often a considerable proportion of broken kernels, which would be better avoided if possible. This may be due to careless handling.

Copra.—Malabar is of excellent quality, but little of it comes to this country; presumably the crop is consumed at home.

Gingelly.—A valuable oilseed, but little is now offered to the United Kingdom. There will always be a market for this at competitive prices

Rapeseed.—There have been complaints in regard to this article of recent years. *Toria*, which is a much esteemed description, is more erratic in its oil content than formerly and, on the whole, tends to give a lower yield, although occasionally very good shipments come to hand. Generally in regard to rapeseed there is less care taken in keeping descriptions distinct. *Toria*, Ferozepore, Cawnpore, &c., are found to be occasionally blended, so that such parcels do not conform to any genuine standard.

Oral Evidence.

54,654. *The Chairman*: Mr. J. E. Frost, you are a Director of the British Oil and Cake Mills, Limited. We have a note of the evidence you wish to give: do you wish to make any additional statement at this stage?—I do not think so, beyond what I have outlined here.

54,655. Can you suggest any means by which the demand for Indian oil-seeds might be stimulated?—I will begin with linseed. As I have stated, Indian linseed is preferred by us to any other variety, and we should like to have more of it.

54,656. Could you take it at existing prices?—The premium for Calcutta linseed varies; the market really is governed by the Argentine supply. We have to put one against the other and buy the cheapest variety, but the quality of Indian linseed is better; it produces a better quality oil, an oil that is preferred by the linoleum makers, paint makers, and varnish makers. It would be to the interest of this country generally, I think, if we could get more Indian linseed, as we have to fall back on the Argentine for the greater part of our supplies.

54,657. It would be in the interest of the country generally?—Yes. The means of getting a bigger supply of Indian linseed, of course, does not rest with us; I can only state that we should like to have more of it, and we should buy it always in preference, at level prices. By that, I mean not on exactly the same quotation as the Argentine seed, but at the same value.

54,658. With regard to oil made from cotton seed, the superiority lies with American and Egyptian rather than with Indian, does it not?—Yes. We do not get any American cotton seed in this country now; it is apparently all consumed in the United States. Our principal supplies come from Egypt, and increasing supplies are now coming from the Sudan.

54,659. How about the comparative quality of Egyptian and Indian?—Nowadays the finest cotton seed that comes to this country is from the new plantations in the Sudan; the next to that is Egyptian seed known as the black variety. After that comes the Egyptian Sakalaridi quality; all those are preferable to the Indian. At the same time, Indian seed is a very welcome seed to us, and particularly what is known as the black seed which has come in recent years, shipped from the port of Karachi. That contains a larger percentage of oil, and it also has the advantage of making what we call a black cake. We must regard that black seed as quite a valuable seed, and we should like to obtain larger supplies of it. It also comes very clean.

54,660. Do you associate excellence in the seed with any particular quality as regards the cotton?—I have no expert knowledge in that direction, but I am afraid the best varieties of cotton sometimes produce qualities of seed which are not so good from our point of view. If you take the Egyptian, the black seed is better seed, but the cotton, I think, is of shorter staple. Sakalaridi seed is distinctly inferior, but I am given to understand that Sakalaridi cotton is much superior. I do not know what happens in India in that respect, but I presume that this new black seed is a better variety of cotton too.

54,661. The area irrigated by the new dam in the Sudan, you say, yields particularly high quality?—Yes. The seed comes sound; there is no damaged

grain in the new seed from the Sudan, whereas in Egypt particularly, and in India, sometimes the percentage of damaged grain will go up to twenty per cent.

54,662. Damaged in the ginning?—I do not know when the damage arises; I should imagine it is from inferior cultivation on exhausted ground.

54,663. Is it a more brittle seed?—The seeds are sometimes black, weevil eaten and that sort of thing; it is what we call country damage.

54,664. Not crushed or bruised?—No, it is not external; it seems to be internal damage, inherent inferiority.

54,665. I dare say you heard the evidence given by the preceding witness on the question of groundnuts and the groundnut trade?—Yes. Before proceeding to deal with groundnut, may I add, with regard to cotton seed, that our chief complaint is that the shipments are sometimes not sufficiently pure to their description? With regard to shipments from Bombay, the old-fashioned Bombay cotton seed is of a dark buff grey colour, which is of good quality, and yields eighteen or nineteen per cent. of oil. Of course, the oil yield, as you will imagine, is the first consideration with us. But there are other qualities of a pearly grey colour which comes from other parts, and which contain sometimes as little as fifteen per cent. of oil, and I have know them with less. Now those inferior qualities of seed are being mixed, and in recent years have been very much mixed, with true Bombay.

54,666. Where is the mixing going on, do you know?—I have no knowledge of what happens on the other side; I only know the seed when it reaches here. Also, I do not think proper care is taken in preparing the seed for export; I am inclined to think there is at times a deliberate admixture of sand and dust, because why should seed shipped from Karachi come to this country practically dustless, while shipments from Bombay and other places sometimes go up to three per cent. of dust and dirt? I cannot understand that myself. Of course, it is a very serious matter to us, because, under the Feeding Stuffs Act of this country, if our oil cakes contain more than two per cent. of sand we are liable to prosecution, and we have got into trouble before to-day with regard to our Bombay cotton cakes in that respect.

54,667. Can you clean cotton seed?—It is difficult; it seems to be much easier to put dirt in than to take it out. Also, there is considerable negligence at times, the admixture consisting of pieces of iron, etc.; I do not know whether they are deliberately thrown in, but it would appear to be so. You would hardly credit the quantity of iron that our magnets take out of cotton seed.

54,668. I suppose that is probably in the ginning?—It is miscellaneous pieces of iron, nails, needles and curious pieces of metal of all kinds. I do not know how they find their way into the gins; I do not think they do.

54,669. *Dr. Hyder*: You say there are needles; surely needles cost more than cotton seed?—That may be so, but they are there all the same. I should think it is due to pure carelessness.

54,670. *The Chairman*: As regards groundnuts, you have heard the evidence given by the last witness: would you say that, broadly speaking, you agree with that witness's view?—Yes, I do; I agree with what Mr. Steiner has said. Groundnut crushing in this country is not a very ancient industry; I think it is only for the past twelve or fifteen years really that we have been crushing groundnuts here. My experience with regard to Indian groundnuts is that the quality is improving. My experience is that dry decortication is much commoner now than it used to be. But what I do not understand about Indian groundnuts is, why the Coromandel nuts should come so very broken. May I explain that the most expensive nuts that come to this country are Chinese Hand-Picked Selected? It is possible that you may have seen a quotation for that particular kind, apart from what Mr. Steiner told you, with which I entirely agree. There is a special quotation for Hand-Picked Selected. Of course, one expects to find those quite

unbroken, but if you take Chinese nuts as a whole and nuts that are shipped from Bombay, they seem to me to come to this country practically unbroken; but the Coromandel nuts are very broken, at times. What I cannot understand is that in making up the standard, as we do every month, some shipments will come almost whole, while other shipments are broken and full of smalls and dirt. Why there should be such a divergence I do not know; to my mind it points to carelessness on the part of some shippers, and I should think there is considerable room for improvement there.

54,671. Does that unevenness tend to depress the crop's reputation or the markets?—Yes. It deteriorates the value to us, because when a nut breaks and the inner surface is exposed, it oxidises, and up goes the fatty acid. An increase in fatty acid, of course, means an increased loss in refining the oil.

54,672. Do you look forward to the day when there will be a definite maximum percentage of free fatty acids fixed?—We, as manufacturers of oil, have the fatty acid already fixed for us in regard to crude oil; we have to sell on a maximum content of free fatty acid.

54,673. That is the law?—It is the trade law.

54,674. The trade rule?—Yes. But I think it is all a question of price with regard to raw material, because seasonal conditions sometimes, it seems to me, will dictate the acid content of the nut; it is not always, I think, within the control of the grower.

54,675. If a standard for groundnuts for export from India were fixed, let us say of five or five-and-a-half per cent. maximum would that greatly enhance the reputation of Indian produce in the markets with which you are familiar?—If you like to fix a standard, the lower you make it of course the more it would enhance the value of the product; but as a buyer of nuts, I do not know that I am particularly enamoured of buying under those conditions; we know a good nut when we see it and we are satisfied with that.

54,676. Yes, but from the Indian point of view, it may be that a comparatively small percentage of very faulty cargoes unduly damages the reputation and depresses the value of Indian groundnuts?—It is quite possible.

54,677. Do you think it is so?—I think they get into the habit, on the other side, of blending groundnuts; I believe that much of the oilseed we get is blended; the bad is put into the good, and it is just made to pass a certain standard.

54,678. Where is the blending carried out?—Speaking of cottonseed in Egypt, for instance, it is blended there, the good and the bad.

54,679. And in the case of groundnuts?—In the case of groundnuts I should imagine that the same thing is done.

54,680. In India?—I should think so.

54,681. That does not quite tally with your evidence a moment ago as to the striking disparity between the qualities of certain specimens that you see month by month?—On the surface it would not appear to do so, but all the same, I should think that many of the individual shipments are blended. There is a great temptation to a grower to get rid of as many nuts as he can, even if they are damaged, and my opinion is that a great many nuts are shipped which it would be better for the reputation of India not to ship. That applies not only to India, but to other countries as well.

54,682. The effect of fixing a standard for export is not merely to prevent certain inferior qualities from being exported, but also to bring disciplinary pressure upon those whose wrong practices are, to-day, responsible for a considerable proportion of the damaged nuts?—Exactly.

54,683. If they are unable to amend their practices, they will lose their business?—Yes.

54,684. Do you remain of the opinion that, as a buyer in this country, you are not inclined to favour any proposal for fixing a standard for export from India?—Do you mean by the oil content or fatty acid values?

54,685. *Professor Gangulee*: And percentage of refraction allowed?—There is a great difference of opinion in the trade with regard to that; some would like to have every precaution of that kind taken; personally I would not; It is a matter of personal opinion. You see, a knowledge of one's trade comes in in business, and if you have sufficient knowledge to take care of yourself without these precautions, to put it plainly, you can make more money than you can if everything is cut and dried and arranged mathematically.

54,686. *The Chairman*: That is very important evidence. Mr. Steiner told us that, in his judgment, Indian groundnuts were holding their own in the world's market. To what extent do you agree with that?—In this country we have rather favoured the undecorticated nut which we get from West Africa, because it is very much easier to crush with old type machinery and the cake sells well; with modern machinery by improved processes the decorticated nut is coming more into favour. My own company has put down a lot of machinery in these last few years to deal with decorticated nut and, on that account, I think we shall go more and more on to the kernels, and therefore favour the Indian produce accordingly.

54,687. To that extent, you think the prospects before the Indian trade are good?—Are better, yes.

54,688. But, up to the present, has not it been the case that increase in the world's supply of groundnuts has come, at least during the past decade, mainly from sources other than Indian sources; for instance, there has been an increase in the Nigerian crop?—Yes, I think so.

54,689. So that India has not had a fair share of the increased trade in groundnuts?—As I told you, the trade is rather young in this country; as far as I can see, India has had quite a fair share; it is tending now, in my opinion, rather to displace other sources of supply, notably the West African.

54,690. So that you do not agree that the exportable margin in India has been a stable quantity; you think there has been an increase?—I was only speaking of this country; I think Mr. Steiner was speaking of the continent at large.

54,691. Would you like to say anything about the other oil seeds such as sesamum, or copra?—My acquaintance with Indian copra is very slender; I have really nothing to say about that. With regard to gingelly, we have crushed it in past years in rather small quantities. That is a seed that we should like to see more of, but unfortunately, it is so expensive that we can very seldom buy it in competition with other things. It makes a beautiful oil and a beautiful cake, but we have to leave it alone on account of the price. Just harking back to cottonseed, it occurs to me in regard to what Mr. Steiner was saying in relation to home consumption, that we get figures weekly from Egypt showing the arrivals from up country into Alexandria, in which the local consumption is shown up to date. Of course it is comparatively easy to do that in a country like Egypt with practically only one port, but I suppose those figures would hardly be obtainable in India. It is done in Egypt where we know what the local consumption is from week to week. With regard to rapeseed we have a complaint to make. *Toria* is, I think, the earliest harvested; I think it is first shipped in January and early February. *Toria* rapeseed, from our point of view, is the best rapeseed that comes from India; it makes a valuable edible oil, a nice blend oil. The early shipments still generally come pure, like the good, old *toria* seed that we used to know; but as the season advances, it seems to me in the latter part of February and March, the Ferozepore comes on the scene, a smaller and inferior seed; we believe

that this is mixed with the *toria*, because the shipments later in the season are inferior. The *toria* that comes then is not, in our opinion, genuine *toria* seed. That is a practice which certainly militates against the value of Indian rapeseed. I should like to say that our business with India generally is of the most pleasant description; seldom, indeed, is there any dispute at all with any of the shippers with whom we have the good fortune to deal; we really know them all and they are most excellent firms. I do not think anything could be better done on this side than what those firms do.

54,692. In no case do you buy in India, I take it?—No.

54,693. Do you think Great Britain is likely to take an increasing proportion of the world's supply of oilseeds?—My company take a large proportion of the oilseeds imported into the United Kingdom, but the quantity we can take is limited to the quantity of cake that we can dispose of. We can always sell more oil, but there is a limit to the demand for oilcake. I myself do not think there is much scope for any substantial increase in the quantity of oilseeds crushed in this country.

54,694. *Professor Gangulee*: But your livestock farming is being extended in this country, and with that extension, do you not think there will be a greater demand for oil cakes?—Yes, it depends upon that factor, but foreign competition is so intensive and severe in the seed-crushing and agricultural industry that it would be rash to predict any considerable increase in the consumption of home made oilcakes.

54,695. *The Chairman*: You do get into Denmark to some extent do you not?—To some extent, yes, spasmodically; in some years we do not export there at all, while in some years we do.

54,696. *Professor Gangulee*: With regard to linseed, you say the quantity exported annually from India appears to be declining?—Yes.

54,697. Could you tell the Commission what are the factors which are responsible for that decline?—That I cannot say; but if you take the ten years from 1907 to 1916, half way through the War, there was an average annual export from India of 324,000 tons. In the succeeding ten years, the average annual export was 262,000 tons. But what the reason is I do not know; all I know about it is that it is purely a matter of price.

54,698. Perhaps the British oilseed-crushing industry has not revived from the effects of the War?—I think it has; we crush more. I must admit there has not been a very great increase since the War, but I think we are just about holding our own. The foreign competition has increased enormously.

54,699. Do you think the Argentine crops have anything to do with this decline in the export from India?—Yes.

54,700. To what extent do the Argentine crops affect the Indian export?—The Argentine crop is immeasurably larger from the point of view of export. If India exports about 300,000 to 350,000 tons, the Argentine will export perhaps 1,500,000 tons.

54,701. That is the quantity, but how about the quality? How does the Indian quality compare with that of the Argentine?—The Indian quality is superior; it contains about two-and-a-half per cent. more oil, and that oil is of a better quality.

54,702. It gets a premium price for that excess of oil content?—Yes.

54,703. What are the trade varieties of linseed that generally come from India?—The most expensive, the best kind, is what is known as Bold Bombay, large Bombay seed.

54,704. There you do not get any admixture, it is a pure variety?—We buy it on pure basis.

54,705. Is there any system of grading in the linseed trade?—No; only for damaged seed.

54,706. Do you consider a system of grading would be advantageous?—I have nothing to suggest in the way of improving the system of marketing Indian linseed.

54,707. You do not import any linseed cake from India?—We do not, but some merchants do and, of course, compete against us.

54,708. I see in your note you do not mention anything about castor seed?—No.

54,709. Is there no possibility of export of castor seed from India?—My firm crush and extract castor seed, but it is a branch of the business with which I personally do not have much to do.

54,710. There is a great deal of demand for castor oil; it is most essential for aeroplane engines?—Yes.

54,711. I see you import only such seeds, for crushing, in respect of which you can get a market for the resultant oilcakes?—Yes.

54,712. Is there no market for castorseed cake?—Yes, there is a market for the castor meal too, not as an edible product.

54,713. It cannot be used as a food for livestock?—It is used as a fertiliser.

54,714. It is not much used in this country?—No, not so much.

54,715. May I take it that it is because you cannot get a market for the by-product, that is oilcakes or castor meal, that you do not import castor seed?—We do buy castor seed and we crush and extract it.

54,716. Not to the extent that you buy linseed, cottonseed and groundnut?—No, because, after all, castor oil and castor meal are not of the same value; they are not in the same demand as regards quantity as linseed and cottonseed.

57,717. So that we may take it in this way, that the demand for oilcake largely affects the trade in oilseeds?—It does, in this country.

54,718. *Sir Henry Lawrence*: Do I understand that you would prefer to get groundnuts exported from India with the shells on?—No, not necessarily; I think the tendency of the trade now is to prefer a decorticated cake. The feeders of cattle now want the rich foods; our trade is changing; the County Council Agricultural Advisers are now advocating richer foods for cattle in order to produce increased milk, and therefore the kernel will be more in demand, in my opinion, than in the past. I think it would be useless and a waste of money to export nuts in the shell from India, on which, of course, the freight charge would be very much heavier. The point is that the kernels should be carefully prepared before shipment.

54,719. *The Chairman*: Formerly, did you embody the shell in the food cakes?—Yes.

54,720. Giving a ration of cellulose?—Yes; the cake, as a whole, is quite a good food.

54,721. *Sir Henry Lawrence*: But you do treat groundnuts which you receive in the shells from Sudan and Nigeria?—No, I think Nigeria exports kernels only; we get our shell nuts from Senegal and Gambia.

54,722. You have no difficulty in dealing with them?—No.

54,723. But, on the whole, you would prefer to receive the kernels only?—Yes, that is how the trade is tending now.

54,724. *Sir Thomas Middleton*: How does the post-War demand for the Bombay cotton cake compare with the pre-War demand?—So far quite well, but the quantity has not been so great, and I am rather doubtful about the future, because many of these Agricultural Advisers now are recommending to drop the use of cottoncake, and we are rather wondering what is going to happen. It may be that the answer to it is that cottonseed will have to be decorticated much more than it was.

54,725. There is very little decortication of cottonseed in this country, is there?—None at all, to my knowledge, at the moment.

54,726. My point was, how does the value of Bombay cake compare with the value of Egyptian? Has it about the same relation to Egyptian cotton-cake as before the War?—No, that is a fluctuating figure. This year, for instance, the enormous crop of American seed has rather frightened the world, and a very large crop of Egyptian seed combined with that has lowered the value of Egyptian seed in relation to India; the consequence is that the Egyptian cottonseed has been so cheap that we have bought very little Bombay seed at all. In the ordinary way, we might look for a difference, in price, of 30s. to 35s. a ton between the two.

54,727. You will remember the time when buyers would scarcely purchase Bombay cottoncake, I suppose?—I remember the first shipments of seed to this country, yes.

54,728. Do you remember the difficulty of getting it placed on the market?—Yes, I do.

54,729. Has the prejudice lasted?—No, it has quite gone; in fact, live-weight tests were made, and strangely enough I think they were slightly in favour of Bombay cake.

54,730. Has the quality of the Bombay cake been maintained since the War; you mentioned differences in the quality of cottonseed; that is what makes me ask the question. There is the pearly grey seed that you referred to?—Yes.

54,731. Is that affecting your cake?—No, it makes a fair cake, not so good as the genuine Bombay, but the oil yield is so small. If you have a Karachi seed, a Bombay seed, and this Broach or Coromandel, and keep them separate, I should say the qualities are quite maintained. There is a seasonal variation; this year, for instance, Bombay seed is some of the finest that I have ever seen.

54,732. Was the complaint against this pearly grey seed low percentage of oil, not the increased percentage of fibre?—Both, but principally the former.

54,733. *The Chairman*: Have you ever addressed complaints or suggestions about any Indian produce to Governments or Agricultural Departments in India, or do you belong to any society which does so?—No; any complaints we may have to make are addressed to the shippers with whom we deal.

54,734. *Sir Henry Lawrence*: You are not in touch with the Indian Trade Commissioner, Mr. Lindsay?—No.

(*The witness withdrew.*)

Mr. ALFRED WIGGLESWORTH, of Messrs. Wigglesworth & Co., Ltd.; Lt.-Col. Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., Chairman of the Advisory Council for Plant and Animal Products at the Imperial Institute; Capt. S. E. J. BRADY, M.B.E., Board of Trade; Mr. E. J. W. BUCKPITT, J.P., representing the Rope, Twine and Net Manufacturers Association; Mr. H. A. F. LINDSAY, C.I.E., C.B.E., Indian Trade Commissioner; Dr. GOULDING, Secretary; representatives of the Advisory Committee on Vegetable Fibres, Imperial Institute.

MEMORANDUM ON THE PACKING AND GRADING OF EAST INDIAN HEMPS.

(1) East Indian hemp has recently begun to be used on a larger scale as a substitute for Russian hemp (*Cannabis sativa*), which is difficult to obtain, owing to the great reduction in production since the War and the consequent increase in the consumption of the smaller output by Russia herself.

(2) A prejudice has always existed that the wear of Indian hemp exposed to water is less satisfactory than Russian. Recent tests at the Imperial Institute tend to dissipate this prejudice, and these are being carried further.

(3) The consumption of Indian hemps is limited by—
(*a*) the great irregularity of quality;
(*b*) excess of dust and dirt in the fibre; and
(*c*) the unreliability of the packing.

(4) As regards (*a*), this is due to differing conditions in the cultivation in different Provinces; some growing the crop in the cold weather season and others in hot weather; some retting the material in water under satisfactory conditions—others, such as in the Benares area, over-retting the material and making the fibre so weak that it will not stand the scutching, resulting in about 25 to 40 per cent. of stick being retained in the fibre and baled up and shipped to Europe.

(*b*) Some districts, such as Philibit and Chandausi, ret the fibre in mud, and even put mud into the dried fibre after retting, resulting in so much dust and dirt in the material that the factory workers in many countries decline to spin it.

(*c*) Relates to unreliability of packing, the grades shipped not always representing what is sold, and fibre of various districts being mixed in the same bale.

(5) It is of paramount importance that hemp should be shipped under the name of the Province or district by which it is currently known in the trade, and that no substitution of inferior grades or mixing should be permitted.

The following are the customary trade designations and they indicate fairly accurately the provinces or districts from which the hemp is drawn:—

Dewghuddy (Deogad).
Itarsi.
Sewnee (Seoni).
Jubblepore.
Philibit.
Benares.
Bengal.
Coconada.
Gopaulpore.
Warangal.
Godavery.
Palinari.

(6) Since the dressing or hackling of hemps (a process of purifying by passing through pins and extracting the tow and some of the dust) has been adopted, a fairly steady and growing demand has set in, and in this form the material makes a better substitute for Russian hemp than in the raw state. It has been stated, however, that the material is not baled in a satisfactory way. In some cases the heads of the material are much too small—scarcely more than an inch in diameter, in place of four or five—and instead of being tied about 6 inches from the butt end they are turned into a plait and both ends tied together, thus entailing considerable labour and wastage in undoing this plait before the fibre can be used by the spinners. Furthermore, the material is put into a powerful hydraulic cotton press and is baled to about 50 cubic feet to the ton, thus flattening the fibre to such an extent that when it comes from the bales it has lost its loose and spinnable character and is flattened beyond recognition. To obviate this, it is suggested that the practice of other producing countries should be adopted, and that such material should be baled more loosely. In order to ascertain the best cubic capacity, an experiment would have

to be made to ascertain whether 60, 70 or 80 cubic feet to the ton would be most suitable so as to permit the material to come from the bales in a way which would satisfy the consumers. It is admitted that the freight would be higher, but this should be more than counterbalanced by the enhanced value of the fibre.

(7) Some years ago, Sir David Prain—when he was Director of the Sibpur Gardens, Calcutta—inaugurated an experiment in sowing under identical conditions seeds obtained from the various *sunn*-growing districts of India, with the result that the produce was almost identical and not more than £1 or £2 per ton difference in value could be ascertained. This is to be contrasted with the wide differences in quality to-day, which range from £16 for No. 3 Benares—which probably contains approximately 35 per cent. of stick and dirt—to £35 for Fine Dewghuddy. A still further improvement in value is obtainable as the result of dressing and hackling the raw material in India, such material realising a price of £40-45 for prime dressed.

(8) A recent visit to His Majesty's Naval Dockyard at Chatham enabled the Committee to ascertain the requirements of the Navy in regard to Indian hemps, and they were able on the spot to verify the defects alluded to in the above report. It is considered that no obstacle stands in the way of a remedy of these defects, and it is thought that the improvements could best be effected within the trade itself, without necessitating direct action on the part of the Government. In connection with possible action by Government, reference is invited to the Committee's letter of the 9th May addressed to the Secretaries of the Royal Commission.*

(9) It is realised that the Agricultural Departments throughout India might assist considerably in improving the preparation and growth of hemp by disseminating accurate information on the cultivation, quality of seed, time of sowing, pulling of the hemp at the correct moment so as to obtain the best results, drying the hemp in the sun before immersing in the retting pits, carefully instructing the growers as to the correct period of retting so as to get the best results, and general instructions for preparing the material for the market. The practice obtaining in Italy on these and other points is a model which might well be investigated in the interest of Indian cultivators.

(10) A leaflet recently issued by a Department of Agriculture in India on the subject of the cultivation of *sunn*, conveyed instructions which would not be helpful to the production of good fibre, but it is understood that these instructions were intended to apply to the cultivation of the crop for seed purposes. It is important that no misunderstanding should arise and that instructions which may be issued for the cultivation of *sunn* should clearly indicate the best means of producing a good fibre.

(11) With regard to marketing, we are of opinion that the existing system of marketing *sunn* in India might be considerably improved at origin. The small dealers who collect up-country are undoubtedly responsible for prices paid for superior material being low in comparison with those paid for the inferior. In Bombay, better control might be exercised in the selection, so as to keep separate the fibres from the various districts. Certain well-known houses take great care in this respect and their marks are recognised as high standards, but there are certain other houses on whom no reliability can be placed.

(12) With regard to marketing in Europe, we are of opinion that since the organisation of the London Hemp Association, which has formulated a definite and carefully thought-out Contract and has established a panel of arbitrators to assess differences in value, the existing houses are capable

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* *See* Appendix.

of carrying out the distribution of the fibre in the European markets in a satisfactory way.

(13) The following samples are submitted:—

(*a*) Sample drawn from hemp showing the result of over-tight packing.

(*b*) Sample of *sunn* (*Crotalaria juncea*) as cultivated experimentally in Africa by the Empire Cotton Growing Corporation.

(*c*) Sample of Russian Siretz (i.e., uncleaned hemp) (*Cannabis sativa*).

(*d*) Samples of yarns spun by Messrs. J. & E. Wright, Ltd., from various qualities of *sunn* hemp.

APPENDIX.

LETTER FROM THE SECRETARY, ADVISORY COMMITTEE ON VEGETABLE FIBRES, TO THE SECRETARIES, ROYAL COMMISSION ON AGRICULTURE.

Imperial Institute, London, S.W.7.
9th May, 1927.

Advisory Committee on Vegetable Fibres.

DEAR SIR,

With reference to Imperial Institute letter of the 17th November forwarding a memorandum on Indian hemp which had been prepared by the above Committee, I have to inform you that at a meeting of the Committee on the 23rd February further consideration was given to this subject. Attention was drawn to the difficulties which are encountered in attempting to secure any improvement in the preparation of the fibre and to the need for research in this connection. After discussion it was decided to bring the difficulty to the notice of the Indian Agricultural Commission and to enquire whether it might be possible to impose a small cess (similar to that imposed on cotton under the Cotton Cess Act) on all the hemp produced in and exported from India, on the understanding that the cess should not be large enough to affect the price of the fibre. The Committee were further disposed to think that the fund so created should be applied to research on methods of improving the production and preparation of the hemp and should be administered by an organisation constituted on lines similar to those of the Indian Central Cotton Committee.

I am instructed to add that if the Commission intend to take evidence in England this Committee will be glad to arrange for evidence to be given on the subject of the condition in which hemp is marketed in this country, together with recommendations for its improvement.

Oral Evidence.

54,735. *The Chairman*: Mr. Wigglesworth, you are of the firm of Wigglesworth & Company, Ltd., and you are Chairman of the Advisory Committee on Vegetable Fibres and for the Packing and Grading of East Indian Hemps?—That is so.

54,736. You are supported here, to-day, by some of your colleagues on that Committee?—That is so.

54,737. Perhaps you will decide who amongst you will answer particular questions?—I shall be very glad to answer any questions or refer them to my colleagues if necessary.

54,738. We have a note of the evidence you wish to give us; would you like to make any statement at this stage?—I propose to enlarge on that statement a little, though I think, perhaps, further information will be elicited in the course of our statement. I wish to say a few words briefly

about hemp as hemp. Europe was dependent entirely upon *Cannabis sativa*, that is the real hemp, for centuries until other areas developed, such as East India, New Zealand, the Phillipine Islands and Mexico, where indigenous fibres were discovered, which, though not of the real hemp plant, were fibres strong enough to be manufactured into ropes where strength and size were essential. These became known and gradually, to a large extent, supplanted the use of hemp which at one time was grown in this country, which later was obtained almost exclusively from the Baltic Provinces and the interior of Russia, being shipped from Riga. Latterly the tendency has been for material grown in other countries to take the place of this European fibre, and the War accentuated the movement, because the change of conditions in Russia and the substantial increase in the cost of agricultural produce there since the Soviet regime, has brought the fibres of India and other countries once more on to a more competitive basis than before. The work of my Committee is mainly to enable us to direct the energies of the fibre producers in various parts of the Empire to producing a quality of fibre which will be more suitable and more competitive with these varieties grown in Europe—Italy, Hungary and Russia—which are admittedly the very best. India has latterly come to the fore with this fibre, produced from a plant known botanically as *Crotalaria juncea*, which really has nothing at all in common with this *Cannabis sativa* or real hemp, except that it produces a fibre which, when it is carefully prepared and compared with real hemp, is such that it would be very difficult to find any visible difference. Our Committee realises that India can go a long way further than it has gone in the preparation of this material, firstly, by better agricultural methods; secondly, by intelligent research as to the times when the seed had best be sown; thirdly, by research as to when the stalk should be pulled, because the strength and quality of a fibre depends very largely on whether you take it in an immature condition, whether you take it dead ripe, or whether you take it after the plant has seeded and has parted with a very large proportion of its natural strength and quality; and, fourthly, if the Government of India assists the Committee in co-operation on these lines and we succeed in improving the production of the material, we have to make further inquiries as to how far that production may be prepared by selection and baling for the European consumers so as to give them the greatest possible satisfaction. Now, briefly, we have proof that there are many practices in India which might be vastly improved, both as regards agriculture and the date at which the seed is sown, the time and method of retting, the selection and grading, and even the baling. In every respect my Committee will be in a position to give valuable counsel if we have the support of the Indian Government and its Agricultural Department to help us to get these ideas carried out, and I have no hesitation in saying that, within the next 10 years, we might double the consumption of Indian products in the European market.

54,739. What exactly is the constitution of your Committee?—The Committee consists of the Director of the Imperial Institute, Sir David Prain, Director of Kew, Captain Brady of the Board of Trade, a representative of the Overseas Trade Department, the Trade Commissioner for India and other men drawn, as far as possible impartially, from those who are engaged in every process concerning hemp: that is from the merchanting to the spinning, and rope-making and twine-making, and the various processes for which hemp is used. There are various associations connected with each of these processes from whom we were lucky to secure the services of one of the members nominated by the Chairman of that particular association, so that you may regard our Committee as by far the most representative Committee in this class of material that has ever been got together in this or any country.

54,740. When was the Committee constituted?—Roughly a year ago; it is the result of the reconstruction which is going on at the Imperial Institute.

54,741. What channel of communication is open to the Committee between this country and India? How do you bring information and advice to the proper quarters?—I am sorry to say that the channel of communication has not yet been definitely established. There has been, during the time of this Committee and before, a certain unofficial correspondence going on between myself and certain sections in India, such as Dr. Clouston, the Agricultural Adviser to the Government of India, whom I know personally and with whom I stayed in Pusa during a visit to India in 1925, and occasionally with different Departments of Agriculture; for instance, that of Bengal at Dacca where they have the all-important jute preparation and a very considerable trade in the hemps which we are now discussing, shipped from Calcutta.

54,742. Indian hemp stands in a class by itself, does it not?—Distinctly, but Indian hemp, in certain of its grades, is remarkably similar in appearance and strength to Russian hemp; that perhaps is the nearest substitute.

54,743. Do you regard the world demand for Indian hemp as more or less stable and fixed?—By no means; you have only to regard the figures of imports to see how very unstable it is. I think you may account for that by the fact that, so far, Indian hemp has been used as a substitute fibre, and that if we could establish its use as a permanent article used by itself, we should stabilise demand and price.

54,744. In order to do that, would it be necessary both to improve the quality and to narrow the range of quality?—To improve the quality, yes; to narrow the range of quality, if you mean by that eliminating the worst and bringing the lower grades up to the better, yes.

54,745. Has your Committee, or have you, ever considered the possibility of organising the hemp interests in India from the grower upwards through those interested in distribution as far as the ultimate consumer, on some such plan as that on which the Indian Central Cotton Committee is organised?—We have not on our Committee considered that so far, perhaps because we have not had time to. Personally I have never considered it, because I should have thought the problem was far too vast to be undertaken by any one individual. (*Captain Brady.*) Might I interpose there to say that the Committee has drawn your Commission's attention to the suggestion of the Indian Central Cotton Committee that a similar cess should be levied for the improvement of hemp, and a copy is attached to the memorandum submitted to this Commission of the suggestion they make as to a similar organisation. (*Mr. Wigglesworth.*) I rather think we might ask Mr. Lindsay to tell us how far they have got with regard to that.

54,746. *The Chairman*: Certainly.—(*Mr. Lindsay.*) I may say I had been in close touch with the Agricultural Departments in India before this Committee was formed. I wrote on several occasions to them, pointing out the difficulties in methods of collection and preparation of hemp for this market; so that the work of this Committee fits in very well with the clearing of the ground which has already been covered in consultation with Agricultural Departments in India. This idea of imposing a cess on exports in order to improve local production is an idea which, I know, has been before the Government of India for some years past. Actual effect was given to it in regard to cotton by the imposition of the cotton cess; the tea cess has been in force for some time past, but I do not think any step has been taken in India with regard to hemp for the introduction of a similar cess. I should like to add that I think, if funds could be collected in that way, they could be very profitably spent in India with a view to assuring the cutting of the crop at the right time and with a view to improving the conditions, particularly of retting and preparation in India for the market. (*Mr. Wigglesworth.*) I should just like to say in connection

with that that only this morning I received, from Dr. Clouston, samples of Indian hemps which had been pulled and retted at different periods in the life of the plant, and the result is most illuminating. There is, undoubtedly, a very considerable difference in the value of the material as between the plant which has been pulled immediately after flowering and others which have not been pulled until the material was fully ripened. Those are technical points which it is an early date to discuss and which I would rather submit to my whole Committee for a general discussion with other experts; but, briefly, much greater strength, to my surprise, was visible in the fibre which was mature, but the fibre was bolder and harsher to the feel and would not spin so fine as the immature material; it would be for the experts to decide whether the whole output should be prepared so as to attain the maximum strength, even at the cost of some coarseness, or whether a proportion of it might very well be made in a finer degree for other purposes. That is a technical point which would have to be considered and which shows the necessity of the closest possible collaboration between our Committee and the authorities in India.

54,747. *Sir Thomas Middleton*: You are referring now to the *Crotalaria juncea*?—Precisely; we do not refer at all to the real European hemp; as Sir David Prain knows, its cultivation is prohibited in India, except by Government.

54,748. *The Chairman*: Are any standards of quality and purity in vogue in London?—Since the coming into existence of the London Hemp Association, founded I think in 1906, they have established a contract which stipulates for certain prescribed qualities. The standardisation which is the direct result of that work, has unquestionably added immensely to the popularity of Indian hemps and, I should say, greatly increased their consumption.

54,749. Are you satisfied with the terms of that contract?—The terms of the contract are satisfactory as far as the commercial terms are concerned; the establishment of grading which is not directed from London, further than saying that it should be Grade No. 1, No. 2 or No. 3 of Bengal or Benares, for instance, might be considerably improved.

54,750. Have you considered, at all, the feasibility of there being instituted, in India, standards for exports, so that if a particular lot of hemp destined for export did not come up to the necessary standard, export in the case of that lot would be prohibited?—I am inclined to think you would have to go a long way before it would be advisable to establish a regulation of that nature; the preparation is so diverse that you might have to exclude whole districts if you did that. I would instance a district in Philibit where the material is prepared by retting in mud, and it is stated, and I believe it to be true, that frequently the growers actually put mud into the centre of the material before they ship it. Of course, Government can take stringent action in cases like that, but I think, before starting any penal clauses, it might be advisable greatly to improve the preparation of the material, and we should come to that at a later point. The sample which I now produce illustrates material containing a great deal of foreign matter which should not be in it.

54,751. *Dr. Hyder*: Does that come from Chandausi?—Yes.

54,752. Do you know Chandausi?—Yes.

54,753. Does it occur to you that there is not much water available in Chandausi, and it may be that the people have to dip it in the mud?—I have considered that, and for that reason have never cared to give any definite opinion as to whether the Government ought to prohibit it or not, because I realise that if they did they might be interfering with an established industry. I agree with you, it is possible there is not sufficient water there.

Mr. Alfred Wigglesworth.

54,754. Where does this shiny hemp come from that you have here?—That I am going to show you later. It comes from Africa; that shows you what can be done in a country which has never grown it before.

54,755. *The Chairman*: In the case of your own firm where do you buy as a rule?—In Calcutta and Bombay.

54,756. Up country as well?—We have our agents up-country in the control of the Bombay house and the Calcutta house.

54,757. Do you carry out any grading?—Everything is graded before shipment.

54,758. At what stage is the grading carried out?—In the case of raw hemps, selection is made into three qualities; then there will be about ten different districts, so that there will be about thirty qualities.

54,759. But in the case of hemp bought by your buyers up-country, is any grading attempted at the up-country centres?—No, not as a rule until it comes down to Bombay or Calcutta.

54,760. Would it be possible to grade it up-country?—Yes, I see no reason why it should not be done. For instance, I remember when the whole of the Benares crop was graded in Calcutta, but now it is graded just outside Benares.

54,761. Would grading at the up-country centre facilitate giving growers an adequate premium for quality?—There is one difficulty about up-country grading: in Calcutta and Bombay, but especially in Calcutta, they have a number of Europeans who are highly expert men and who can control the quality, but these men do not reside in the mofussil districts, where they would be dependent upon the Indians who have less experience of the European markets.

54,762. Is it your view that the cultivator is, at this moment, receiving a sufficient premium for quality?—The general view is that he does not receive the premium for quality. The view I have always taken with regard to that is that seeing that the premium is actually paid by the buyers and consumers in Europe, it is the result of some system of purchase there through many different hands, so that the first man who buys tries to get the best material at the price of the worst. If the grower who produces the best were in touch with the actual house of shipment, he would get better prices.

54,763. Have you any concrete proposals to make for the improvement of the Bombay market in regard to shipping and grading there?—I do not think so.

54,764. Or as to any other matter?—The baling might be very much improved. For instance, in Bombay we frequently find that the grades from Philibit or Chandausi may be mixed with those from Jubbulpore or Itarsi; my feeling is that if each district were kept strictly separate and sold under its own proper designation, you would certainly get the real values and you would get a higher ultimate value for the whole crop; because, if you have only 10 per cent. of inferior grade mixed with the better, very likely you will only get the price of the lowest grade for the whole lot, because the buyer cannot take the risk of selecting it himself and must pay you a lower price correspondingly. Then again, we have a statement in our memorandum about baling; it is so tightly packed that if the material is the least damp, when it comes out of the bales it is like a board. This sample illustrates that, though this has been beaten and it is much worse than that when it comes out of the bale. (*Producing a sample of hemp.*) If, instead of baling to fifty cubic feet to the ton, it were baled to eighty cubic feet to the ton, there would be more freight to pay, but the compensating price would more than make up for the increased freight.

54,765. Have you made representations on that point?—I have personally instructed our shippers to bale to fifty, sixty and eighty cubic feet to the ton.

54,766. And, in the course of time, you will be able, I suppose, to come to a firm view as to the appropriate tightness of these bales?—Yes, I can tell you that at once on opening the bales.

54,767. You say you have to make up your minds whether the ton should be sixty, seventy or eighty cubic feet; you are not quite clear yet as to what is the proper pressure?—Yes, I would rather see it in practice. I think it should be 80 cubic feet, but it would be far better to reserve an opinion until we actually receive the goods. There is another matter of small practical detail. When material is tied round the head like this sample, it obviously involves a great deal of labour to tie it and it involves labour which costs two or three times what it does in India to untie it. These are small details which there should not be the smallest difficulty in overcoming, and yet, in the twenty or twenty-five years in which I have been interesting myself in Indian hemp, I have found it almost impossible to get instructions like that carried out; they seem to be absolutely wedded to habits centuries old and unwilling to make any change.

54,768. Have you got the exact particulars of your contract with you to-day or could we have those?—One has been sent attached to our statement. It is a very well thought-out contract dealing with lateness, unavoidable delay, declarations of the contract, method of insurance, quality conditions, weight, provisions in the case of default, arbitration and so on.

54,769. Is that in line with the contracts in force in New Zealand and the Phillipines?—It is more in line with the contract in force for Indian jute, because being an Indian product, we have as far as possible adopted the practice of the Jute Association, with the necessary variations for the hemp trade. I would like to mention that, some years ago, I had Indian hemp sown in Italy under the same conditions as Italian hemp, which is the best hemp in the world; the result was better than it had ever been grown in India. The improvement in the quality was due, first, to the land being properly nourished, secondly, to its being deeply ploughed and very well cultivated; thirdly, to its being sown in the appropriate season, which in Italy is the month of March just when the sun is getting stronger; fourthly, to its being pulled exactly at the right season; fifthly, to its being retted in exactly the right number of days, because if you ret a material two days too long you rot it, while if you ret it one day too little you cannot clean it; sometimes a few hours will make a difference. Sixthly, it was due to the grading and packing being done on the Italian method. That experiment convinced me that what could be done in Italy by intelligent work could be done equally well in India.

54,770. There is nothing in the climatic conditions?—There is nothing in the climatic conditions.

54,771. *Professor Gangulee*: What are the chief methods in Italy which we in India could not adopt?—I cannot think of any which you could not adopt; but may I point out that in Italy, beginning at the top, the Agricultural Departments give gratuitous information to all farmers, firstly, with regard to the germination of the seed, the percentage of germinability of the seed; secondly, they will analyse and give information regarding the quantity of fertilisers required for certain kinds of soil; thirdly, they supply co-operative assistance, if necessary, with certain machinery which is expensive and which is required for the preparation of the crop. I sent one of those machines to India some time ago to

Sinclair Murray & Company, and that was sold I believe by Sinclair Murray to the Government of India. Unfortunately it was destroyed by fire, and I was told they could not get the necessary vote to put up the £200 to replace it, so that the experiment ended.

54,772. *The Chairman*: Is your Committee concerned with the British aspect only or with the European?—European.

54,773. How does the reputation of Indian hemp stand on the Continent?—Rather low; it contains so much dirt and inferiority that in some countries they have actually legislated against its consumption.

54,774. Has there been a change in the quality, and so the reputation, of Indian hemp? Is it improving or deteriorating?—On the whole improving; it is improving in this respect, that materials are being hackled or dressed in Bombay and Calcutta, and that knocks out a great deal of the dust and dirt. That trade has grown; it produces two classes of material; one the long dressed hemp and the other the tow, and it eliminates ten or twenty per cent. of dust. The proportion of dressed is low as compared with the total export.

54,775. Of the various factors that make for good or bad hemp, is it the case that retting is by far the most important?—I am inclined to think that the preparation of the soil is just as important, and the proper class of soil. It is exactly like cooking: if you leave your beefsteak on the fire for 10 minutes too long you do not want to eat it. Retting is a thing which can be more easily corrected than any other fault.

54,776. Is it necessary that the retting process should be begun very soon after the hemp is pulled?—The very best practice in regard to retting is to dry the material out before it is put in the water at all; if it is bundled straight away from the field into the water, it is full of chlorophyll, that green material will not be removed in the retting process and you will never get as good a fibre. By drying, the plant turns to a normal yellow colour, loses a great deal of its natural moisture, and obviously absorbs the moisture in the retting process much quicker, and gets retted quicker and better.

54,777. What is the usual practice in regard to that in India?—I could not say because it varies in every district. Though I have been in India various times, I have never been able to time my visit to be in any hemp district just as they were doing this process.

54,778. Do you do any retting in your up-country stations?—We have supervised a good deal of retting in Yorkshire in connection with flax some years ago.

54,779. But never in India?—No, that is all done by the peasant grower; there is no retting whatever of jute or hemp in India under European supervision; the whole thing is a peasant industry. In my opinion proper co-operation between the Agricultural Department of India and the peasants would be invaluable. I do not say a large number of demonstrators should be appointed; we must go slowly, but probably the appointment of a larger number of men with sufficient knowledge and experience, not merely students, to tell the peasant what to do, would be very helpful. I think, if in any particular district only one cultivator were converted to improved methods, the fact that his material would sell at a better price than the material of other peasants, should lead the others to follow his example.

54,780. *Mr. Noyce*: If it were merely done by one man, would he be able to sell his material at a better price than the others?—Yes, I think so; the difference would be very great in quality. I may say we are establishing more up-country agencies for the very purpose of enabling the producers of better quality to get the real value of the material,

because it is not the desire of the merchant houses of Bombay that a man who produces good material should get a low price.

54,781. *The Chairman*: Of course it is hard to say, but if a substantial improvement could be effected, is it your view that a very considerable improvement in demand for Indian hemp might result?—If you could get Indian hemp used permanently for the production of certain standard articles, you would get an improved demand.

54,782. So that this is a direction in which successful work by the agricultural departments would be followed, at a very short interval, by an important advantage to the cultivators growing hemp?—Yes, decidedly.

54,783. *Professor Gangulee*: On the question of the standard article that you propose, would you attach a great deal of importance to grading?—Yes, I attach great importance to grading.

54,784. Some time ago, I think, the Board of Trade recommended that the grading should be controlled by legislation. Do you favour such a measure?—(*Mr. Lindsay.*) No, I do not think so, on the whole. (*Mr. Wigglesworth.*) I think it is premature, and I think the system would break down almost at once. What I am pressing and urging is to leave the grading and the packing in the hands of the men who are doing it at present, who are not doing it very badly. Improve the production and the grading will improve itself.

54,785. Would you leave it entirely to the trade?—Yes.

54,786. In what way can the Government Departments assist?—(*Mr. Lindsay.*) That is rather a point of contact between ourselves and the Committee. The suggestion is that Government should enter for the purpose of helping the industry to organise itself. The only method by which organisation is possible is by means of funds; you cannot see these improvements materialise except by means of improved methods, demonstation, improved seed and so on, and right through that whole process of organisation is the need for funds. What we believe, on the Committee, is that Government can help in thus helping the industry to organise itself; that is to say, to subscribe and collect its own funds, and utilise those funds through the expert departments. May I just add one word on the subject of mixing, because it is a very important point: as you know, the mixing question has been very serious in India in regard to cotton. The fundamental principle is this, that, to take the cotton industry as an example, your short staple cotton can secure a higher price if sold in a district where long staple cotton is grown, for the purposes of mixing, than it can secure in the ordinary market under its own name. Now, that is the tendency which, somehow, under the ordinary laws of economics we have got to controvert. In the cotton industry they have overcome that difficulty by prohibiting the transport of short staple cotton into long staple areas which require protection. But whether you can go as far as that in regard to the hemp industry, I should think is very doubtful; I should think some measures might be taken at the point of baling to prevent the mixture of inferior with superior grades. That is to say, at the point of the baling press you might ensure the isolation of the two.

54,787. So that the chief directions in which the departments of agriculture in India could usefully direct their attention would be the cultivation of hemp?—The cultivation, and then, as in the case of cotton, you might proceed up to the point of baling; in fact, up to preparation for market.

54,788. Referring to the deterioration of the Manila hemp, I think you, Mr. Wigglesworth, wrote an article in the "Times" Trade and Engineering Supplement?—(*Mr. Wigglesworth.*) Yes.

54,789. In that article, you referred to the awakening of the Philippine authorities in this matter of grading, and you say that it has resulted in the scrapping of the old grading institution and the formation of a new

Board of Graders constituted on wide lines, with the representatives carefully selected from officials, experts, producers, traders and thus combining all interests. Knowing the Indian conditions as you do, do you think the volume of Indian trade in hemp would justify the formation of such a Board?—I think it is premature in India to consider that; but it illustrates the point we made before, that I do not advocate Government interference because it was through Government interference in the grading of Manila that the whole thing went wrong. It is an industrial Board of technical men now.

54,790. It is not an official Board?—No, the majority are non-official. Yesterday I had, by chance, a visit from one of the leading men on that Board and had an opporunity of discussing the production methods with him. He accentuated very strongly the point that as long as it was an official organisation it was a complete failure, but as soon as you brought technical men into it the results were very different.

54,791. Then you think we should have in India a non-official organisation?—I think the trade itself would have to do that; I do not think that should come from Government, except as a recommendation. (*Mr. Lindsay.*) On the lines of cotton.

54,792. The fluctuation in prices has been, I understand, too excessive to ensure steady cultivation of Indian hemp; is that criticism correct?—The tendency over the last few years has been for the fluctuations of prices on all articles to be very excessive; in fact, they were far too great. That is because of certain economic causes we are not here to discuss to-day; but under normal conditions, given the production of an article which is well prepared and honestly packed, you do not get those fluctuations. I should compare the results as regards sisal which is produced in East Africa on the most up-to-date lines, mechanically prepared, supervised, properly graded, not official grading at all but grading by private people. During the times when Indian hemp was fluctuating more than fifty per cent. of its value, the East African has not fluctuated more than fifteen to twenty per cent., with the same economic causes in operation, showing that a great deal of the fluctuation is due to an article being so inferior that, the moment trade gets bad, it is the first to suffer. In general, in any depression the inferior, whether they be inferior workmen or inferior goods, are the first to suffer: inferior workmen are out of employment while other workmen are still employed, and inferior goods cannot be sold while better goods keep on going into circulation.

54,793. I understand from your answers to the Chairman that the Russian hemp at the present time is not coming into the market very much?—Very little; it is almost impossible to get it. We know nothing whatever about the acreage and production in the last three or four years: we are absolutely at sea. Mr. Buckpitt, who is a prominent consumer of that article, will be able to support me in this: the consumers will be very glad to find something upon which they can depend as to export and know they will not be left without material when they require it.

54,794. Suppose Russia has come into the market, Canada is trying to grow hemp: when all these countries put hemp on the market, do you think India can hold her own?—Does India hold its own in jute?

54,795. There is a monopoly?—Yes, but why is it a monopoly? Because you have the most ideal conditions for producing that fibre in the world; the same is true with regard to hemp. With your enormous population in India of highly intelligent people—I repeat, highly intelligent people—capable of learning, capable of doing really good work when properly directed, willing to work for moderate wages with whole families engaged in the operation, not reckoning so much an hour for their work, you have ideal conditions for the production of a material of which, if found satisfactory, the consumption could be five or ten times what it is to-day.

54,796 *Mr. Calvert*: Could you tell us whether any commercial use can be made of wild hemp?—What is wild hemp?

54,797. Wild *cannabis* that grows all over the Northern Punjab?—I am afraid not; I regard nothing that you can get for the picking as of the slightest value. To illustrate the point; I remember, some years ago, there was great excitement when a man was offered a vast concession in India of the fibre growing on the sides of the railways 200 miles long; he wanted to get up a company with a capital of £200,000, and he was terribly astonished when I told him it was not worth a halfpenny. You must concentrate, you must have fibre properly looked after, grown where there is labour available and where conditions are right.

54,798. Have you anything to say about Indian flax?—Indian flax has been experimented with, I believe in Bihar, and I think near Cawnpore, and a very successful quality was produced. Why it was not proceeded with I am unable to say.

54,799. *Sir Ganga Ram*: Do you deal with any other kind of fibre imported from India, rhea, for instance?—On so small a scale that it is not worth mentioning; most of the rhea is imported from China, not from India.

54,800. But at one time there was a great demand for Indian rhea?—Yes, but there never was a great production of it.

54,801. Is there any limit to the altitude on the hills at which hemp can be grown?—Yes, distinctly, there is, of course, a limit.

54,802. Up to what height does it grow?—It is a crop for the plains; it should not be grown on the hills.

54,803. It will not grow on the hills?—No.

54,804. *Mr. Calvert*: About 3,000 feet?—That is the very extreme.

54,805. *Sir Thomas Middleton*: Have you any information as to the total crop available in India?—Yes, we have full statistics of it.

54,806. Both of that exported and that used internally?—No, not that used internally; we have tried to get that, but it has been impossible to get either the acreage or the actual production. The reason given was that, frequently, *crotalaria* is used for the purposes of manuring the successive crop, as green manure.

54,807. That is its common use in the Bombay Presidency?—Yes, and the peasants when they sow it do not know, depending on the rainfall, whether they are going to mature all of it or none of it or part of it. I think that makes the statistics with regard to acreage almost impossible and certainly unreliable.

54,808. What is the price of hemp coming from India at present?—The cheapest quality coming in to-day is worth £19 a ton; that is from the Chandausi districts; the best, from the Dewghuddy districts, sells at £34 a ton. That really represents a difference, not in the length or anything of that kind, but in the treatment of the material.

54,809. That difference in value arises almost entirely from the retting, does it not?—Yes, to a very large extent; the colour and cleanliness is due to that.

54,810. Is there much difference in the strength?—Yes, the Dewghuddy is distinctly stronger than some of those from Chandausi.

54,811. Are the weak fibres due to over-retting?—In the case of Benares over-retting is the cause of the weak fibre; that is very light in colour. Where you over-ret you get a very white colour. Why I suggested the departments of agriculture intervening in this is that you strike an exact medium where you get both good colour and good strength; carry your retting too far and you will sacrifice the strength.

54,812. Are there any circumstances leading you to suspect that the strength of the fibre has suffered from poor cultivation?—No, what would happen from bad cultivation would be that you would get a short fibre

instead of a long. If you were to pull the material before it is mature, then you would get a weak fibre, or if you were to over-ret it you would get a weak fibre.

54,813. *Dr. Hyder*: You have spoken about Chandausi; it appears to me that much of this loss of quality is due to the fact that there are no water ponds available; you know the mud is about knee deep; in a district where you have plenty of water, you have a better kind of fibre after retting?—May I ask if there is much dew in Chandausi?

54,814. Always in September?—If the fibre were dew-retted it would have no dust or dirt at all in it, but they would get a rather darkish material. The whole of the American crop is dew-retted and not water-retted at all, for the same reason, that they have insufficient water; but their material does not contain dust and sand and dirt.

54,815. I have seen it myself; they actually dip it in the mud?—Dew-retting means laying the stalk flat on the ground after it is cropped and turning it over every two or three days, so that the effects of the alternate dew at night and the hot sun in the day extract the material which makes the fibre adhere to the stick and so enables them to clean it.

54,816. Your Committee is concerned with vegetable fibres of all sorts, is it not?—Yes.

54,817. Has the West African thistle any economic importance?—Do you mean thistle or *sisal*?

54,818. No, *sisal* is different. I was talking to a man, in Mülhaus, who is in this business of hemp and jute; I asked him about substitutes, and he mentioned West African thistle?—Are you sure he did not mention nettle. Sir David Prain is an authority on the subject. The rhea fibre is of the nettle family. (*Sir David Prain*): Yes. (*Mr. Wigglesworth*): Nettles in this country also contain fibre, and that fibre was extracted by the Germans during the war as a substitute for flax, but it is not an industry and never will be.

54,819. Is there anything by way of a substitute growing in Madagascar?—Nothing that will take the place of this; Madagascar is far behind.

54,820. Is there anything by way of a substitute coming from French Indo-China?—Nothing at all.

54,821. They are doing something at Mülhaus?—There are specimens and samples coming all the time, but we keep records of all the imports and exports of fibre, and they are not coming in any quantity. The French are trying certain fibre developments in Indo-China, but they are succeeding very badly; they are not keeping pace with us.

54,822. *Mr. Noyce*: I understand your Committee consider that hemp is a suitable crop for an organisation such as the Indian Central Cotton Committee?—I think it is.

54,823. Have you given any consideration to the question of getting a satisfactory personnel for such a committee in India? One of the reasons why the work of the Indian Central Cotton Committee has been so successful has been the interest the Indian mill industry, generally, has taken in its work?—(*Mr. Lindsay*): I should think the agricultural experts and the exporters between them would form a satisfactory nucleus; and I should think also the agricultural representatives, that is to say, the growers' representatives, could also be available. The Cotton Committees, as you know, are composed of growers as well as millowners and exporters.

54,824. Do you think exporters really take a great interest in quality?—I think so. I think on the Cotton Committee, for example, the cotton brokers and cotton shippers do play their part.

54,825. The amount which has been suggested as a suitable cess for Indian hemp is four annas per cwt.; that is, 7s. 6d. a ton. I presume the price of

a ton of hemp is such that that would have no serious effect?—(*Mr. Wigglesworth*): I think it is far too much; my own idea would be one or two annas a bale or something like that.

54,826. I thought you said the price of hemp was about £19 a ton?—That is the price of the lowest quality.

54,827. Surely 7s. 6d. would not make much difference to that?—It would make an enormous difference.

54,828. That is the point I wanted to get at. If you consider that four annas per cwt. is a great deal too much, there would be extremely little in the way of funds for this committee to administer, as with four annas per cwt. the total proceeds of the cess would be only a lakh and a quarter?—That is a great deal of money.

54,829. But if you say that is a great deal too much and you would put it at about one anna per cwt., they would only have about Rs.30,000 a year?—I think Rs.30,000 a year is the nucleus of a very considerable sum, and I would far sooner see the thing grow gradually, instead of having a lot of money before they know how to spend it.

54,830. Do you not think general revenues could put up Rs.30,000 a year without causing the dislocation to the trade which would be involved in the levy of a cess, however small?—(*Mr. Lindsay*): The trouble is that general revenues are liable to re-consideration at every Budget time. (*Mr. Wigglesworth*): Another thing is that I believe in contributory interests: I think it is only right that the trade should contribute a cess of this kind. When I was in East Africa, about a year ago, I was very strong on having a cess on coffee there, because the coffee people were getting money from one of the public departments, and in that case could very well afford to pay a small cess as they are doing in tea and cotton. I think it is a much sounder principle than taking money from public revenues, even though it is very small in India.

54,831. Who would pay the cess if it were imposed: the cultivator or the importer?—I do not think you could collect it from the cultivator; I think the cess should be imposed in the same way as it is done with regard to cotton. Who pays it in the case of cotton?

54,832. It is actually collected from the mills or the exporter. What I am referring to is the question of the ultimate incidence: is it actually paid by the consumer or the exporter?—Every charge is paid by the consumer ultimately. I thought you meant who would collect it.

54,833. No, I wanted to know what your views were as to who would pay ultimately?—I think that is a question to ask an economist.

54,834. *Dr. Hyder*: Supposing the price went up by 7s. 6d., do you think the 7s. 6d. would remain on the back of the cultivator?—No, I think about 21s. would come on to the ultimate consumer, because obviously you will have five or six different people, each taking a profit on that 7s. 6d.

54,835. You mean, it will come on to the back of the consumer?—Yes, it always does.

54,836. If you have no more hemp and no substitutes for hemp and your demand for hemp remains unaffected, then perhaps it might all go on to the back of the consumer, but not otherwise?—(*Mr. Lindsay.*) Might I suggest for the consideration of my Chairman on this point that it seems to me that, in the matter of hemp, the market is fairly large and that Indian supplies do not cover the whole market; therefore it is not likely that a 7s. 6d. cess would affect the volume of India's contribution towards the general pool. I do not see how, in those circumstances, the general price of hemp would rise; that is to say, that this cess would become an addition to the particular charges inherent in the trade from India. It would be as much a market charge as the cost of transport, i.e., the cost of rail from the field to the port, or the cost of steamship freight from the port to London; it would be a charge inherent in the cost of marketing, and I do

not see how one can avoid the conclusion that that cess would really be paid by India in the case of a commodity which is so extensively satisfied in London from other sources than India. (*Mr. Wigglesworth.*) That is exactly my view.

54,837. *Mr. Noyce*: In that case it would be the cultivator who would pay and not the consumer?—I have taken precisely the other view.

54,838. I think Mr. Lindsay suggests that the cultivator would pay. One of the points Mr. Lindsay mentioned in connection with the cess is that the imposition of a cess would ensure the cutting of the crop at the right time; I should like him to explain that.—(*Mr. Wigglesworth.*) If that 7s. 6d. a ton is going to get one or two pounds more a ton price for us, it is an investment; if the charging of a cess of 7s. 6d. is going to improve the quality so that you get one or two pounds a ton more in the price, that will be an advantage to us. In mentioning that figure I am suggesting something very small, because I have just shown that it is quite possible to convert the £19 quality into a quality worth £34. When I am asked who is going to pay it, I say again it is the consumer who is going to pay it; in any case, he will be getting a better quality and will be pleased to pay more for it.

54,839. *Dr. Hyder*: So that the effect of the cess might be that you might have an improvement, and benefit the producer, the consumer and the trade; is that so?—Yes.

54,840. *Mr. Noyce*: Mr. Lindsay has not answered my last question. You have mentioned, as one of the objects which would be secured by the imposition of a cess, that it would ensure the cutting of the crop at the right time; I was wondering how it would have that effect?—(*Mr. Lindsay.*) By demonstration.

54,841. You mean if the cess were spent on demonstration?—Demonstration is one of the most important items in the scheme.

54,942. You say in your note: "A leaflet recently issued by a Department of Agriculture in India on the subject of the cultivation of *sunn* conveyed instructions which would not be helpful to the production of good fibre." What were those instructions?—(*Mr. Wigglesworth.*) The instructions were that they should sow the seed three feet apart, whereas you cannot produce a good crop unless it is sown three or four inches apart.

54,843. In the circumstances we had perhaps better not ask which Department of Agriculture it was?—I purposely did not state it.

54,844. The ordinary distance is about six inches?—Yes, three to six inches; four inches is the usual thing, I think. I want to accentuate the point about the tying of this material. It is a very small matter. To twist and plat and tie this material in that way must take a great deal of time, and, as I pointed out, a great deal more time to undo. By simply twisting it once and putting it in the bale, and then not pressing it so tight, it can be taken out and put straight on to the machine, thus saving anything from £1 a ton in expenses.

54,845. *The Chairman*: You have shown us hemp from other sources which is tied in a better way?—Yes, this is a sample of Russian hemp, that is perfectly all right; all the sisal which comes from Africa, all the hemp which comes from Italy, is packed like that; all that comes from Hungary, Mexico, New Zealand and the jute from Calcutta is properly packed. It is a mystery why they should adopt this practice of tying it in tiny hanks and twisting and plaiting it; there is no object in doing so. It may be for transport purposes when they are selling it originally, or it may be to conceal what is inside; I cannot tell.

54,846. *Sir Thomas Middleton*: You do not class *hibiscus* as a hemp at all?—No, it is not a real hemp.

54,847. Do you class it with jute?—Yes. In America they do not use the word "hemp," because they have a duty on hemp, but none on *sunn;* it is really a *sunn.*

54,848. But *crotalaria* is *sunn?*—I thought you were talking of *crotalaria.*

54,849. No, *hibiscus?*—That is jute; I have already answered that question.

54,850. Do you class it with jute?—Yes, as jute. (*Sir David Prain.*) I suppose that would be appropriate. The name "jute" is not known in Bengal, as you know, except among brokers; the cultivator never calls it jute, or they did not 40, 30 or 20 years ago. I have to thank our friend Mr. Wigglesworth for having ascertained, though he probably does not know that he did, what the real jute was. The real jute is the fibre of *hibiscus cannabinus,* but now it has come into favour again in India, and you have got to call it Bimlipatam jute to distinguish it from the thing which usurped the name "jute."

54,851. *The Chairman*: Has colour for its own sake an important bearing on value?—(*Mr. Wigglesworth.*) The appearance always helps to sell; it is generally regarded as a sign of purity when a thing is white and it is tolerably correct.

54,852. *Professor Gangulee*: Is the Department of Agriculture in Bengal aware of the experiment which Sir David Prain conducted?—(*Sir David Prain.*) That was in the days when the Department of Agriculture was the Department of Land Records. What happened in that particular case was this. I have to look at these things not from the agricultural point of view at all; I am not interested in that so much as in the botanical point of view. One knew that there were various ideas with regard to the different kinds of hemp that come from India, and it was my desire to show that certainly it was not in connection with the plant itself, which is as familiar to you as it is to me. I could not therefore ask any Government servant, but I seized the opportunity of a visit to India of a man who was interested in these things. He was making a tour of India to get for himself seeds of the *sunn* plant in every Province that he visited. When he had done this and sent these seeds to me, I got a friend of his who was a fibre broker in Calcutta to come down to the Botanical Gardens at the week-end and see how the plants were growing. Then I got him to select for me one of those men who retted the fibre of *sunn* in Delgarshir district; you know how good that is and what a price it gets. That man cut, retted and prepared the fibre on all those different plots of plants that came from different parts of India. The fibre thus prepared was sent out, as chance would have it, to Mr. Wigglesworth, and he was the broker who was good enough to write and say there was not more than £2 a ton difference in value, and I think there were about fifteen or sixteen samples. So that clears up the possibility of there being any great difference in the varieties of the plant. Therefore, it must be something in connection either with the time of cutting and retting or with the nature of the retting, and these are two processes, as you can understand, about which an Agricultural Department, and only an Agricultural Department, can advise you. I would like to say that, although accident has made me a member of this sub-committee that you have honoured by asking to speak to you to-day, I cannot divest myself of the feeling that I have as Chairman of the Advisory Council for Plant and Animal Products at the Imperial Institute. In that capacity I have listened with great interest to the evidence put before you and to the very wise questions that have been asked. My feeling is that we have before us, at this time, an occasion on which this fibre may be dealt with. As most of you know, this fibre was very much discussed at the end of the 18th century and at the beginning of the 19th century, when the East India Company did its very best to get it taken up by the interests in this

country, but found the interests in this country so opposed to it that it never made its way in the market at all. Now, for the first time, is coming an opportunity when it can come in if India is anxious and willing to take an interest in the thing herself. It may now perhaps establish a sound position as against Russian hemp which it never had before and may never have again. If it is once established in the market it will be very difficult to dislodge in the future. Another thing I should like to say is this: if India refuses to do it, these samples will show that Kenya can do, and Africa will do it. (*Mr. Wigglesworth.*) That is a very strong point; we have only to set the ball rolling in Africa, and it will go very rapidly, because it happens that we have discovered that this *crotalaria* plant is the very best thing to grow as a between-crop with cotton: the boll weevil is destroyed by this *crotalaria;* it cannot live in the presence of that fibre. That is a great discovery.

54,853. *Mr. Noyce*: That might also apply to India?—It will certainly apply to India.

(*The witnesses withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Wednesday, the* 22nd *June*, 1927.

Wednesday, June 22nd, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Mr. J. SWAN, of Messrs. STEEL BROTHERS & CO., LIMITED.

MEMORANDUM.

I note that the Royal Commission particularly desire to obtain information as to the position of Indian rices in comparison with rices from other countries, and my opinion as to the defects, if any, in the Indian product.

In replying to the questions put before me, I should like it to be generally understood that my comments refer directly to Burma rice as distinct from other Indian rices. As will be known to the Royal Commission, the only Province of India which has any appreciable surplus of rice crop available for export is Burma. This brings me to the comparison of Burma rice with rice from other exporting countries such as Siam, Saigon, Japan, Spain, Italy and America. Of the foregoing countries it can be definitely stated that all, with the exception possibly of Saigon, produce a quality of rice superior to the usual qualities produced in Burma. The value of Burma rice in the world's markets is consequently lower than that of any of the countries mentioned with the exception of Saigon.

Until recent years, little money was spent in the Province of Burma in educating the people of the country in the cultivation of superior grains, and even now the steps so far taken to diffuse knowledge of grain and improved methods of cultivation amongst the people of the Province of Burma can only be regarded as a preliminary measure. More intensive steps will have to be taken if Burma, as a country, is going to acquire a reputation for rice equal to the finest rices produced by other countries.

I have therefore to suggest that the efforts of the Royal Commission on Agriculture should be directed towards recommending the Government of India to assist the people of the Province of Burma in their selection of grain and in improving methods of cultivation.

Mr. J. Swan.

In pre-war years the United Kingdom, although in itself not a large consumer of rice, purchased a large proportion of its supplies from Burma. To-day this is not the case. The requirements of the United Kingdom are largely met by imports of rice from America, Spain and Italy, and the quality of grain obtained from these countries is preferred to the Burma grain, despite the fact that the latter grain is invariably the cheaper.

In regard to question No. 20 on the subject of marketing, I have no special suggestions to make. The well-known larger rice millers in Burma—Messrs. Bulloch Bros. & Co. Ltd., Messrs. Ellerman's-Arracan Rice & Trading Co. Ltd., Messrs. the Anglo-Burma Rice Co. Ltd., and Messrs. Steel Brothers & Co. Ltd.—have full knowledge of the world's markets, and every possible source is tapped in order to find a market for Burma rice. In addition to the four firms mentioned there are numerous other organisations who are in touch with the world's markets, and the Royal Commission may rest assured that so far as markets of the world are concerned the rice products of Burma are well known and that methods of distribution at present in existence are fully effective.

The only point, therefore, on which I have to comment is, as stated earlier in this letter, the quality of grain grown in the Province of Burma. I have not commented on rices grown in other Provinces of India. These, with the exception of a small quantity of Patna and Seeta rices, are consumed in the Provinces in which they are grown, and while it may be also desirable to recommend that steps be taken to improve methods of cultivation and quality of grain in the other Provinces of India, the fact that these grains find a ready sale in their own areas does not point to any urgent necessity for alteration in quality. Any steps that could be taken, however, to improve the yield of rice per acre from the various Provinces of India, including Burma, would be of material advantage to the country.

Oral Evidence.

54,854. *The Chairman*: Mr. Swan, you are here representing Messrs. Steel Brothers & Company. We have a note of evidence which you are to give on behalf of the firm; is there any statement you would like to make in addition to that at this stage?—No, I do not think so. The one question I desire to labour is that of selection of grain; I think that is more important, even, than improved methods of cultivation.

54,855. *Sir Ganga Ram*: You are referring to rice?—Yes, rice only.

54,856. Seed grain?—Yes.

54,857. *The Chairman*: Have you yourself had experience of Burmese conditions?—Yes, for 25 years.

54,858. In the main, your evidence applies to Burma rice rather than to Indian rice?—Yes, Burma being the only province of India which has any substantial quantity to export at all.

54,859. How about the reputation of Burmese rice in European markets; does that stand high?—No, it stands lowest of all. I will give you a rough idea of the value: Burma Two Stars, which is a well known quality is worth 15s. a cwt.; a similar quality from Siam is worth 17s. a cwt.; that is £2 a ton in favour of Siam. There is not much difference between Saigon and Burma, but taking the European rices, which are on the increase, Italian rice is worth 18s. per cwt. and Spanish rice is worth about 19s. per cwt.

54,860. Is Burma rice meeting a definite demand for a cheaper quality of rice, or would it be to the advantage of the Burmese cultivator if he could produce a better quality?—It would be distinctly to his advantage, always assuming that it was commensurate with output per acre. The value of his crop can be doubled. There are certain grains in Burma which, in recent years, have been improved; there is a grain known as *Sughundi*.

What the total crop of *Sughundi* in Burma is I could not say, but I should not think it is more than thirty or forty thousand tons, which is a very small percentage of the Burma crop. *Sughundi* is similar in appearance to Siam grain. *Sughundi*, at the moment, commands a price, you may say, of about 2s. per cwt. more than the ordinary rice from Burma. It is a popular rice, but there is not enough of it

54,861. Has the quality of Burma rice been stable and consistent over a long period of years, or is there deterioration?—The position of Burma rice is this: they have stood still, they have neither progressed, nor have they gone back; but any country that stands still automatically goes back; the other countries have improved their rices.

54,862. New business goes to the other countries; is that the position?—That is right.

54,863. To go to a particular point on this question of deterioration: it has been suggested from one quarter that Two Stars Rangoon rice has recently depreciated in size and contains a larger proportion of broken grains than used to be the case. Do you agree with that?—No, I do not agree with that; that does not affect the position at all. We can give rice to any degree of separation if buyers want it; we can give them rice with only ten per cent. of brokens. We have tried hard to make a No. 1 rice popular in the market by taking out the "brokens," but they will not have it. The householder in this country prefers Spanish and Italian rices, and, of course, if he can afford it, the American Carolina rice, which is worth about twice as much as Burma; it costs twice as much as Burma. He will buy these rices every time, because they are better to look at; I do not think the nourishment in those rices is any better than in Burma rice.

54,864. It is entirely a question of appearance?—Yes.

54,865. From another quarter it has been suggested that there was a distinct improvement manifest some years ago as to the quality of grain and absence of other grains, but that this improvement has hardly been maintained?—I think I can probably account for that. About two years ago, they had very serious floods in the Burma delta, and large tracts of paddy land were covered by the river water; a considerable deposit of silt was left on the land which fertilised it considerably; the crop resulting subsequent to the floods was a very good crop; it was a large crop, and it was extraordinarily good. I suggest to you that the improvement of quality was entirely due to that fertilisation.

54,866. You told the Commission that the quality of Burma rice had remained about the same over a period of years. What do you say about Siam rice; has that improved?—Siam has its ups and downs; the grain varies occasionally, but it always maintains a distinct lead over Burma rice.

54,867. How do you account for that lead?—It is a better-looking rice.

54,868. But can you account for it, agriculturally?—No, I do not know whether Siam has spent any more money in demonstration farming, or anything of that kind, than Burma. They probably started with a better record; they probably started growing a white grain, whereas in Burma about half the grain crop may be called red. In America, a wholly red grain is, I believe, described as a "weed." I would say as regards Burma that, if the red could be largely eliminated and a white grain substituted, the value of the crop would go up by almost fifty per cent.

54,869. What is the tendency as regards world demand for rice; is it increasing?—As far as Eastern populations are concerned, it will increase as the populations increase. The population of Japan increases by about a million a year, or something of that kind, and they are large rice eaters; it is the same in China.

54,870. And western populations?—With regard to western populations, I do not know, but as far as I can see, with the exception of Germany and

middle Europe, they do not seem to eat rice in any large quantities beyond what they grow.

54,871. Have you any suggestion for the improvement of the trade, either in Burma or in this country?—I do not think it is a question of the improvement of trade; it is a question of improving the cultivation and selection of seed. If they would establish a few hundred demonstration farms (do not call them experimental farms, call them demonstration farms), throughout Burma, of 200 or 300 acres each, and sell the seed produced from those farms to the cultivators, you would get in Burma, eventually, a grain which would equal some of the best grains grown in other countries. As Sir James MacKenna will know, certain grains are produced at Hmawbi of very excellent quality, and you get there a pure white bold grain. That is an experimental farm; there should be 200 or 300 of those in Burma. I think I am right in saying that the Government of India, in past years, have rather starved Burma with regard to any improvements for agriculture; they have taken it as an accepted fact that paddy grows in water, there is plenty of water, and so they have let the matter alone. Sir James MacKenna may not be able to commit himself to support me in that statement, but I do not think I am far wrong.

54,872. That is your view?—Yes.

54,873. Have you ever considered the advisability of forming some organisation in Burma, on the lines of the Indian Central Cotton Committee, to look after the interests of the trade as a whole, from the producer to the miller and to the ship?—I have not considered it from that point if view, because I think there are so many organisations in Burma ready to market the grain, ready to exploit any small crop like *Sughundi*, or any special grains there may be. We are exploiting each grain as it comes forward and trying to find a market. They have now one crop in Burma which stands out by itself; that is the *Koukyee* crop in Moulmein. It is a crop of about 75,000 to 100,000 tons; it is a very large grain and it is white.

54,874. You are probably familiar with the work of the Indian Central Cotton Committee?—Yes.

54,875. Do you think anything of that nature for rice would be feasible?—I do not think I am well enough up in the details of the Central Cotton Committee and of their programme, to say whether it would apply.

54,876. An organisation of the trade which would take up the problems of research and demonstration, the organisation of the trade, the fixing of standard grades, and so on?—That is a very excellent thing, but I should have thought the Government would take that on.

54,877. You prefer that the Government should do it?—I think they should do it.

54,878. Are you familiar with the trade in Burma?—Yes.

54,879. What is the position to-day as to the unit of measurement? Has the basket been standardised?—As far as I know, yes, but not throughout the entire Province. In Burma, in the marketing centres, the 46 lb. basket for paddy holds good; we measure grain with it, we give allowances on weight of anything over that on a graded percentage.

54,880. Have you any views as to whether purchase should be by weight only, or do you agree with the present customary arrangements?—I think the present system of measurement cum weight satisfies all parties. If you go into the jungle, of course, their methods there are a little quaint, and one village differs from another. They generally gauge their measure by so many milk tins, I think. Weights of baskets vary all over the Province. As far as the marketing centres are concerned, we stick to the 46 lb. basket for measuring paddy, with the exception of Akyab where a 23 lb. basket is in use.

54,881. Beyond that, you have nothing to say about the internal organisation of the trade in Burma, marketing and distribution?—I think it is as good as it is in most other countries; there are middlemen and brokers, and, with communications better than they were before, I do not think the average cultivator sells his grain below market value.

54,882. Have you formed the view that the cultivator in Burma gets a premium for quality?—I do not know whether *he* gets it or not, but if he is in touch with the mills, he gets it every time.

54,883. It is paid, and someone gets it; is your doubt whether the cultivator gets it?—Yes. I cannot be sure, but if the cultivator is remote from a market, he may not be able to get the premium which that grain is entitled to receive; but that grain, when it comes to the Rangoon mills, would receive the premium to which it is entitled.

54,884. Do you think it important that the cultivator should receive quality premium in order to stimulate him to improve his agriculture and the selection of his seed?—Yes. I think it is desrable that he should get the most for his produce, and I think the only way he can get it is by having these demonstration farms throughout the country.

54,885. With regard to the London Market, have you a definite quality contract in vogue?—Yes.

54,886. Perhaps you would leave a copy?—There is an association in London called the London Rice Brokers Association; they take charge of all standard qualities and, along with the shippers, they frame the contracts. If any dispute arises with regard to quality, the standard samples are in the possession of the London Rice Brokers Association, and members of that Association are appointed to arbitrate and settle the dispute.

54,887. Is there a wide range of samples?—Quite a wide range of samples.

54,888. What is the scope of your own firm's business? Do you buy in Burma and ship?—We buy and mill in Burma and we ship all over the world.

54,889. And store in this country?—No; we store a certain amount in Germany; we do not store in this country, the expenses of handling are much too great.

54,890. Do you bring any rice from Burma to this country?—Yes, small quantities.

54,891. When you do store, do you use elevators?—No, we store the grain in bag form.

54,892. Is there any bulk shipping?—No, there is no bulk shipping in rice; it would not carry.

54,893. Why not?—It would heat very badly; rice cargo wants very good ventilation; it must be packed in bags of not more than 2 cwt. in weight and carefully ventilated: it carries reasonably well in fine weather, but if you leave it till the monsoon weather, when hatches have to be kept battened down, you will eventually find at the end of the voyage that the cargo has heated I will give you a case in point. Akyab produces a crop of about 200,000 to 250,000 tons, but there is hardly one grain from that province suitable to ship to Europe this year; that entire 200,000 tons has only one market to go to, and that is India.

54,894. What is the ultimate destination of most rice that comes to Europe? Is it used for food or for manufacturing processes?—Mostly for food in the central European states; there is a lot of rice eaten in Germany, Czechoslovakia, Yugoslavia, Rumania.

54,895. Great Britain?—In Great Britain I do not think the consumption is very large; it does not tend to increase.

54,896. Does any rice flour come into this country, or is it entirely in the grain?—It is known by the term "rice bran"; rice bran comes to this country in large quantities.

54,897. From where?—From Burma.

54,898. Where it is milled?—Yes, it is what is taken off the grain in the process of milling; I should imagine 200,000 tons comes annually from Burma to the United Kingdom.

54,899. That is the shell of the grain?—It is the cuticle of the grain taken off by milling in the cone. The cuticle of the grain is creamy coloured or red; that is milled off in the process of milling by the cone, and that forms rice meal or rice bran. As a cattle food-stuff it is valuable.

54,900. Is there any rice in the bulk imported into Europe?—No, I should say practically none.

54,901. Where is the rice ground that we get in our ground rice puddings? —Carbutt & Coy. in London do it. We have an interest in that concern. They have been doing very poorly and the man who is running the place is tired of it, so we are going to put it into liquidation.

54,902. Does that mean that we shall not have any more ground rice puddings?—I should imagine you can get it elsewhere, because there are a few mills in Liverpool. No ground rice is made in eastern countries, it is all done at home.

54,903. Do you ship from Burma to India?—Quite a lot of rice.

54,904. Is Rangoon a free port?—There is an export duty on rice, not to India, but to other parts of the world.

54,905. *Sir Ganga Ram*: Not to Bengal?—No, India reserves the right to take the rice from Burma cheaper than any other part of the world.

54,906. *The Chairman*: Have you anything to say on the point of shipping freights?—Freight opportunities from Burma are very good, and anything that the regular lines of steamers fail to give in the way of shipping facilities is always augmented by outside steamers; we charter full ships.

54,907. Is there a deferred rebate system in use?—Not with regard to rice; in regard to other products, yes, but not rice; it is a net rate of freight.

54,908. Do you deal with any products other than rice?—Yes, quite a number: teak, cotton, groundnut cakes, and various sundry produce.

54,909. In the case of cotton, groundnut cake and the like, you are within the deferred rebate system?—Yes.

54,910. Have you anything to say about that system, in its effect upon freight rates?—I do not think it has been harmful; the liners trading between Burma and Europe are careful to see that their rates are, in any case, no dearer than the rates quoted by German, Dutch and Italian lines which are also trading from Burma to Europe; as long as they take care that their rates are not in excess of the Continental rates, there is no hardship.

54,911. *Dr. Hyder*: Have these shipping lines any agreement or understanding with Continental lines?—I believe they have some sort of agreement; whether the Hansa Line, which is the big German line, have gone into the Conference again I am not sure, but I should think they probably have.

54,912. *Sir Henry Lawrence*: Why is rice free from this rebate system, if the other products are not?—Rice is a vast commodity; it is available in much bigger quantities than any of the other products of Burma; you can charter an outside steamer and load 6,000 or 7,000 tons of rice without using the liners, so of course the liners say: "Unless we run level with the outside steamer we can get no freight."

54,913. *The Chairman*: They cannot do it with regard to rice?—They simply cannot do it.

54,914. Do you do a trade in groundnuts from Burma?—In their crushed form; we extract the oil there; the oil is used for cooking purposes in Burma: the groundnut cake is the residue and is sent to this country and is used as cattle food-stuff.

54,915. *Professor Gangulee*: Is there any demand for groundnut cakes in Burma for cattle food?—Practically none. In Ceylon, it is used as a

manure for cultivation; that is the only thing they use it for there. But here, in this country, they are used by the compound cake makers; they are mixed with bran and other matter and sold as cattle cakes.

54,916. *The Chairman*: Have you anything to say as to cotton, which crop, as you know, interests this Commission?—I will only express the hope that the crop in Burma will become larger; it is really too small a crop. We have two ginneries at Burma; I think the crop runs from 80,000 to 100,000 bales; it is a very small crop. But climatic conditions are difficult; sometimes we have unseasonable rain and that spoils a lot of the crop.

54,917. *Sir James MacKenna*: During the greater period of your time and my time in Burma, the idea of the rice market was rather quantity than price, was it not?—That is undoubtedly so.

54,918. I infer from your evidence that that position has changed?—We first want quantity, but quality is becoming much more important than it was ten years ago.

54,919. You kept yourself pretty closely in touch with the Agricultural Department while you were out there; can you tell us of any lines of success of the department that came under your notice?—I cannot give you the individual names of grains; I know the improved grains by numbers. You are speaking of grains for instance produced at Hmawbi.

54,920 Yes, anything which struck you, as a miller in Rangoon. as being an improvement in quality of grain?—Undoubtedly, in certain grains which I only know by numbers, there were excellent improvements; we paid a considerable premium for them; they were only available in quantities of 50 to 100 tons; the quantity was so small that it hardly made its presence felt. If we had had thousands of tons of these grains, pure white bold grain, they would have found a ready market at excellent prices.

54,921. But still, it is a fact that it was the policy of your firm and one or two other firms to encourage the Agricultural Department by giving premiums?—Absolutely.

54,922. You will remember, there was rather an extensive campaign a few years ago for the elimination of red grains?—Yes.

54,923 Did you notice any results from that?—I am afraid not; I do not think there has been any material improvement in that respect.

54,924. Of course, it is a very big problem?—It is a very big problem. Red grain as far as I know, can be grown in some of the places where they frequently have floods; it seems to be a hardy plant which can stand up to flood better than the white plant. That has been suggested to me; I am not sure whether it is so.

54,925. Where does this *Sughundi* come from?—It grows mostly in the Henzada district; it has been grown for years, especially in the Moulmein area. But in the Moulmein area it has a curious mousey smell which absolutely destroys its value as far as the western markets are concerned. This *Sughundi* grain is bought by Cuba, Cuba wants it, the West Indies want it, the German market wants it. The German market buys it and sells it as Siam; they do not seem to have any qualms in that respect.

54,926. Is the Moulmein crop keeping up its reputation, the *Beelugyum* paddy?—The *Beelugyum* paddy is very good; on the whole it has kept up its reputation and stands out as one of the best grain in Burma.

54,927. It has been suggested that what has been called the so called Japan type is suitable to Burma?—I rather agree. When Spain went in for the cultivation of rice, they looked round the world to see what was the best rice to grow. They fastened on Japan, got their seed grain from Japan, and they were very successful. It is a small round transparent grain; it is not exceptionally small, but it is round and not elongated. It looks very well. Personally, as far as its value as a food stuff is concerned, I would much rather have a Meedoung grain from Burma, but Meedoung grain does not look nearly so well.

54,928. On what lines do you think the Agricultural Department should go now in Burma?—I would suggest that they should have many demonstration farms; do not call them experimental farms, call them demonstration farms, have a few hundred of these throughout the Province.

54,929. Seed farms?—Yes. They should sell seed to the people in the neighbourhood, who would see these crops growing and would see that the results were good.

54,930. *The Chairman*: Why do you make such a point of their being called demonstration and not experimental farms?—Experiments are apt to be regarded by the people of Burma as useless and not worth bothering about; but anything in the way of a show and a demonstration they pay more attention to.

54,931. *Sir Thomas Middleton*: Why not call them seed farms?—Demonstration seed farms if you like.

54,932. *Sir James MacKenna*: There is a proposal before the Government of Burma to extend these seed farms very extensively?—I think that will go a long way to help.

54,933. And to have godowns to distribute the seed?—Yes. Of course, in Burma, where you have the smallholder, the position is much more difficult than in a country where there are vast tracts of country under one ownership; that is a point which can never be got over.

54,934. In that respect however, Burma is probably better off than they are in India?—Yes.

54,935. *Professor Gangulee*: From your replies, I gather that the appearance of the grain is an important factor?—Very important.

54,936. Is rice cleaned and polished for the European market?—Yes.

54,937. It has to go through a special process?—Yes, a special process.

54,938. When you speak of the good quality of the Burma rice, what specific qualities do you look for: appearance only?—Appearance. I mean, you have got to meet your demand; if the demand says it wants appearance and not good natural qualities as a food, you must give appearance.

54,939. So, when you advise the Government of Burma to improve the quality of rice, you simply mean that they should improve the appearance of the grain?—If you improve the appearance of the grain you are not probably going to harm its qualities as a foodstuff. I do not for a moment suggest that you should harm its qualities as a foodstuff, but keep those good qualities and improve the appearance.

54,940. In the contract, do you specify certain appearance with reference to quality?—We will sell any quality that is wanted; if the market say they want any quality, we will make it for them. There is no question of our trying to thrust down the throat of any possible consumer a quality we wish to give him; we have to give him the quality he wants.

54,941. What is the exact quality your market wants?—The Western markets want a well milled quality: nice white looking stuff, well milled; call it highly milled; that is probably the correct way of describing it.

54,942. Japan has lately entered into the market as a rice importer?—Yes.

54,943. As you suggested, her population has increased?—Yes.

54,944. In the beginning of this century, she used to export rice; now she imports rice?—That is right.

54,945. Has her entry into the field affected the market?—It has enabled Burma to get more for her rice than she would have got, but Japan will only buy what is called Kanoungtoe grain, which is a white grain, and Meedoung.

54,946. Japan has not affected the market on this side?—Yes. Japan is buying in the East; Europe wants to buy in the West; they compete with each other in the matter, and Burma, as a result of this competition, will possibly get a better price.

54,947. Patna rice has established a very great reputation in the Western market; do you think the export market can absorb a great deal more of Patna rice if it can be grown?—I think it undoubtedly would.

54,948. At a premium price?—Possibly not such a high premium if it were obtainable in large quantities; the heavier the quantities you put on the market the greater is the tendency to depreciate your price.

54,949. You refer to the export duty; how much is it now?—Three annas a maund.

54,950. Is that F.O.B.?—Yes.

54,951. What is the unit of shipment from Burma? Is it 2 cwt. bags?—It varies a lot; it is 2 cwt. to Europe; to India it is all sorts of weights, from 168 lbs., 163 lbs. and 164 lbs. Bombay takes 168 lbs.; Calcutta takes 163 to 166. Why, I do not know.

54,952. There is no definite standard?—No.

54,953. When India imports rice from Burma there is no definite unit of shipment?—No.

54,954. *Mr. Calvert*: It is true that Egyptian rice has a special reputation in the Mediterranean countries?—I do not know much about Egyptian rice. It is a very good rice; as a rule, they export their own crop and import rice from Burma.

54,955. So that there is a market for quality?—Undoubtedly.

54,956. *Mr. Kamat*: Would you care to send a few samples of American and Italian rice for the information of the Commission here?—I will let you have any samples you would care to have.

54,957. You have said that rice is appreciated here by its appearance; do you mean its bold appearance or the white colour or both?—Both the bright colour and the bold appearance are appreciated in this market.

54,958. So that if fine grain of white colour were sent here, it would not be appreciated because of its being small in grain; do you follow what I mean?—It it were small in size, yet bright in colour, it would still be appreciated, but it might not be appreciated to the same extent as a fine bold grain.

54,959. Are you aware that, in India, in good families, Burma rice, however, bold or white it may be, is not cared for and would not be touched for table purposes?—That I do know. I am not absolutely certain of the reasons, but I know it is the case.

54,960. And bold Burma rice is reserved, in such families, for the use of servants only?—I agree that is so.

54,961. There are tracts of country in India which produce beautiful white rice of fine grain; if that were exported here or to other European countries, would it be accepted?—Undoubtedly, if it were fine white grain.

54,962. But as there is not sufficient for internal consumption, it would only mean that India would have to fall back upon Burma rice to replace whatever is exported here?—That is so.

54,963. But still, rice of that kind would find a good market here?—Equally, as you know, Patna has a wonderful market; it goes because it is a wonderful grain; it has got a reputation extending over a long period of years. I think good Patna is worth to-day about 25s. per cwt.

54,964. Do not people here attach any importance to the digestibility of rice?—I do not think they study it; they do not study it in this country in the same way as in Eastern countries, where rice is the staple food.

54,965. In India, rice-eating people can tell you the digestibility of rice in one day by one single meal; the next morning they will tell you if the rice is bad?—And I suppose they can be reckoned to be fairly accurate in their judgment.

54,966. They consider that the Burma rice is hard to digest?—I cannot see that exactly, because in Ceylon where we now ship to in quantity, we have developed a very large trade in what is known as parboiled rice.

Formerly, Ceylon used to buy all its parboiled rice from Bengal; they now buy practically nothing from Bengal; they will not look at it; they prefer the Burma rice. The coolies on the tea estates thrive on it; they cook it the night before, they eat some of it, they sleep and when they wake up in the morning, there is some of that rice left. It has not gone sour; they simply heat it up.

54,967. Do not they attach any importance to the flavour of rice in this country?—I do not think the average cook or *chef* in this country knows anything except the appearance of the rice; it is covered with glaze which goes off the moment you put it in the pot, and appearance counts for such a lot in this country.

54,968. Would it be worth while educating public opinion as to the flavour and digestibility of rice in this country?—I think anything of that nature that can be done in this country would be of great advantage, but whether it is going to tell with the people, I do not know.

54,969. You do not think it would succeed?—I would not go so far as to say that; I would welcome any efforts in that direction and I would support them.

54,970. You suggest that good selected grain should be evolved by means of demonstration farms. In certain parts of the country it is impossible to grow certain strains of rice owing to climate conditions or soil conditions?—Yes; therefore, as I say, research must go hand in hand with the demonstration farms. It is no use trying to grow, in certain soils, a grain which will not grow there; it is for the chemist to say whether this soil will be satisfactory for any particular seed. Soils have to be analysed just the same as grains have to be studied.

54,971. For instance, a certain fine strain of rice would be easily grown round about Bombay, but 200 miles down the West Coast it would not grow at all?—I quite agree that might happen.

54,972. So that it is not purely a question of multiplying demonstrations farms?—No, it is not; research must go hand in hand with it.

54,973. *Sir Henry Lawrence*: Are the prices, which you quoted, prices on the London market?—Yes, London or European markets.

54,974. Does the same rate prevail in the ordinary European markets as on the London market?—I presume so; of course it is in different currencies.

54,975. Germany or Yugoslavia give preference to the same grains as London does?—Yes.

54,976. And you would find the same variations in price?—Yes.

54,977. Do you export from any other part of India than Burma—No, only Burma, but we also export from Siam.

54,978. With regard to the Indian grains, Bombay, Madras and so forth, which vary very much from the Burma grains, do you know anything about their destination? Does any of that go outside India?—With the exception of the Patnas and Seetas which go from Calcutta, I do not think any goes out of India. You will notice however that rice moves from Southern India to Ceylon, but it does not go out of India proper, including Ceylon as part of the geographical area.

54,979. Are you acquainted with the movements of rice from one part of India to another?—No, I cannot say that I am.

54,980. Do you know that you may have rice moving from Sind down to Western Bombay, and at the same time, the reverse flow of certain kinds of Bombay rice into Sind?—No, anything that moves on the railway, I really do not have any knowledge of; anything that moves from one port to another I can of course get full statistics of.

54,981. There are markets for special small varities of rice, matters of taste and so on?—Yes, for instance to Bombay we export a grain known as

Yethalay; it is a tiny, thin grain. It is appreciated in Bombay; I cannot tell you why; but we found they wanted it and sent it there.

54,982. There was a great shortage a few years ago in Western India and rice was imported from Burma; we found rice being readily taken in small quantities at twice the price in one shop, if it came from other parts of India, while Burma rice was absolutely refused by even the humble classes of Indians. What is that due to?—Does not that rather emphasise my point about quality. The Western world and the other parts of the world will not take the inferior grain from Burma, so all the inferior grain is dumped into India; it is only natural that, in India, they prefer to eat their own grains, which I have no doubt are vastly superior to much of the grain that comes from Burma. Half the rice of Burma is a red grain and is of very inferior quality; it has got to find a market somewhere and it goes to India.

54,983. In your opinion, there is an immense field of work for the Agricultural Department in finding out means of improvement of the various kinds of grain grown inside India?—Yes, undoubtedly so.

54,984. That work has been taken up in Burma; do you know whether it has been taken up elsewhere in India?—In Burma it has only been taken up on a very small scale; at the present time, I think, there are only four experimental farms in Burma.

54,985. *Sir James MacKenna*: They have gone ahead a lot in the last three years since you left?—I have got the 1926 publication of the Department of Agriculture in Burma in front of me, and those are the only four I find in this volume, as far as rice is concerned.

54,986. *Sir Henry Lawrence*: What proportion of the rice grown in Burma is exported: fifty per cent.?—I think it is fifty per cent.; the crop estimate, as far as I know, is generally about double the quantity available for export.

54,987. And the total amount of rice grown in India, which is exported, represents something less than ten per cent. ?—I could not tell you with any accuracy.

54,988. *Sir Ganga Ram*: Is there only one variety of rice which is grown in Burma, or are there several varieties?—I should think there are two or three hundred varieties; but the only main varieties that are known in Burma are *Ngatsaing* and *Meedoung*. *Meedoung* is a round fat rice.

54,989. What is the difference in price from the highest, the most superior quality, to the lowest quality?—I should say about 6s. per cwt. difference between the highest and lowest qualities; that is £6 a ton.

54,990. The lowest price being what?—If you take your lowest quality at 10s. (I am only taking this as a figure) your highest quality would be 16s.

54,991. Then, do you generally export the lowest quality or the medium quality?—I export what my buyers wish me to export; I must be guided by what they want, but I can tell you none of the buyers want the lowest quality.

54,992. What is the demand? Is it a demand for the superior quality?—A demand for the superior grain.

54,993. The most superior quality?—Yes.

54,994. Are you aware of the fact that the yield of rice varies inversely as the quality; that is to say, the yield of coarse grain is much more than the yield of superior grain?—I do not think it is always the case; I know it is, occasionally, the case that in yield per acre we get a much bigger quantity of coarse grain than of the better grain, but only sometimes.

54,995. It is a fact; we grow, in the Punjab, twelve varieties of rice grain and I have carefully observed that: it varies inversely as the quality?—Are you talking of wheat?

54,996. No, rice. We do not grow enough for export purposes. There is a place in Peshawar where a rice is grown which you cannot even get

for two *seers* a rupee: the quantity produced is so very small that the yield is so small?—The yield is a very important factor, undoubtedly.

54,997. *Mr. Calvert*: Is it still true that the best rice in India is grown in Peshawar Valley?—I should have to refer to Sir Ganga Ram to answer that question.

54,998. *Sir Ganga Ram*: When you import rice grain into England, is a portion of it mixed with husks?—No, the days of shipping what was known as cargo rice are over, but a certain amount of rice known as *loonzain* is still shipped; that means it has only had the husk taken off but there may still be two per cent. of unhusked grain left in the rice.

54,999. I know they used to mix unhusked rice with it on the ground that it kept it cool?—In the old days, they shipped it because it remained more bulky in the bag; the ordinary bag would only hold 220 lbs. of what was known as cargo rice because it bulked more in the bag.

55,000. Is it the fact that, in European countries, they do the pearling process?—Yes, that is through the cones.

55,001. Is that only in this country or in other countries?—In Burma we do all that.

55,002. The pearling process as well?—Yes.

55,003. For the purposes of export to England?—Yes.

55,004. And to other European countries?—Yes, and to India and everywhere.

55,005. Not to India?—Yes, we pearl for India. You have first to put the rice through the hullers to take the husk off.

55,006. The process of pearling takes away some of the nutritive value of the rice?—I am well aware of that.

55,007. Therefore, in India they will not take it?—They take low milled rice, but they must have something taken off. They will not usually eat the rice with the cuticle on it. In India, they like it low milled with just the cuticle scraped off, whereas in this country they want it well taken off and the grain very white. I agree with you that, in removing that cuticle and the outer portion of the grain, you are removing a lot of nourishment.

55,008. You say that, by shipping it in bags, the grain is more ventilated?—Yes.

55,009. Does that apply to wheat?—No, you can ship wheat in bulk.

55,010. But why does it not apply to wheat?—That I cannot tell you, but the fact remains that it is so. You cannot ship rice in bulk, otherwise it would swell up and probably burst the ship.

55,011. *Professor Gangulee*: Is it due to the presence of excessive moisture?—It is due to inherent moisture in the grain.

55,012. *Sir Ganga Ram*: Do you deal in walnuts from Burma?—No.

55,013. *Sir Thomas Middleton*: Do the tastes of the British people and of the people of Central Europe differ in the matter of rice?—Yes, they do vary; Czechoslovakia is very fond of Moulmein Koukyee rice, big bold white grain; Germany will take some of the ordinary *Ngatsaing* grain, but Czechoslovakia is one country which prefers this *Moulmein* grain.

55,014. I suppose you would be in a position to give a specification to a plant breeder who was attempting to meet the demands of Europe: you could tell him, precisely, what he ought to aim at?—We could find out what he wants and we could give him anything he wants; from our mill in Hamburg we will produce any rice he wants.

55,015. The plant breeder has got to find out what you want?—Yes.

55,016. You would be able to give him a specification to work on?—Yes.

55,017. How many specifications would be wanted for your clients: three?—A good many more than that.

55,018. We do not want to give him too complex a problem?—I would not bother about that; after all, if you grow a nice white grain and aim at competing with either Siam or Japan, whichever grain is most suitable to the area of cultivation, as long as you have the grains of these other countries beside you, you cannot go wrong.

55,019. Are there fashions in rice consumption? Does the fashion vary from period to period in this country?—I do not know, except that I can say that this country, that is the United Kingdom, eats much more Spanish rice now than it did before; that is simply because Spain has improved its quality, and this country has got used to it and they eat it.

55,020. *Professor Gangulee*: When you say improved their quality, that is to say their appearance is better?—Their appearance is better.

55,021. *Sir Thomas Middleton*: Does Spanish rice resemble Carolina rice in any way?—No, Spanish rice resembles the Japanese rice; it is a round grain, transparent.

55,022. Apart from the appearance, are there any differences in the cooking qualities which commend certain rices to the British consumer?—We cook rice very badly and cooks must have a rice which cooks easily. The trouble with Burma rice is that the average cook at home says it takes too long to prepare; it has to have longer steeping; with the Spanish and these better rices, the process of steeping, I understand, is considerably less than with the Burma rice.

55,023. We were told that Siam is now exporting a rice with the germ attached, which is commending itself to the British market?—I have heard of that but I cannot trace it yet, I mean, what is meant by this term.

55,024. There cannot be very much coming into the market or you would know about it?—I have not noticed it; I have brought Siam rice to London this year, but what this germ is that they refer to, I do not know.

55,025. The germ is the embryo of the seed?—That is true.

55,026. That is what it means, but how it adheres to polished rice I do not quite understand?—Nor do I, because, as I say, the market at home, here, judges rice entirely by appearance and its simplicity in cooking. If there is anything specially particular about Siam grain, I am not aware of it.

55,027. *Dr. Hyder*: What chance is there of the invention of and introduction of rice hullers worked by hand, in Burma?—I do not think that is going to be of any particular advantage.

55,028. I think they import these rice hullers from America, do they not?—Mostly from Germany.

55,029. Are they not very expensive?—No, they do not go in for hulling purely and simply by itself; you can buy, for Rs.20,000 or Rs.30,000, a small rice mill complete.

55,030. The Burma people consume rice and they must have some kind of machine to hull the rice; do not you think there is a very large scope for the introduction of machinery worked by hand?—I do not think so, because every village has its own mill; this little mill produces the rice for all the villagers round about.

55,031. You say that costs about Rs.30,000?—Yes; they are neat little things and very effective. Hundreds of them have been put up since the War, far too many; there is far too much milling power in Burma at the present moment.

55,032. In what other dishes do you use rice?—Curry, and, as far as this country is concerned, rice puddings.

55,033. Does the polishing of rice have any effect on the vitamin content?—I do not think it has been boosted in this country enough yet; I think considerable boosting by advertisement might do some good.

Mr. J. Swan.

55,034. *Mr. Noyce*: Do you think the cultivator in Burma will respond readily to any efforts made by the Agricultural Department to put out better varieties?—I think, undoubtedly, he will.

55,035. Both the Indian and Burmese cultivator?—Yes.

55,036. *Dr. Hyder*: Where should these experimental farms which you suggest be placed? Should they be placed near race courses or near the rivers?—You have got to put them where it is suitable; where there is railway communication and where there is river communication is probably best.

55,037 The race course and the river are the places where the Burmese like to go?—After all, they can always have their bullock-cart races in the jungle.

55,038. *Sir James MacKenna*: There are some serious minded Burmese?—I think there are.

55,039. Have you anything to say about Burma beans?—I think the Burma bean has acquired a notoriety for containing a small percentage of prussic acid. I have eaten these beans frequently and have never suffered in any way from them.

55,040. How is the market now?—It is not a very free market; I understand that the Burma bean is debarred from America as poisonous.

55,041. It sells in Europe?—Yes, the home market buys it.

55,042. Every now and then there is a scare?—Yes.

55,043. *The Chairman*: You go on eating them yourself?—Yes, I personally do; it makes no difference to me.

55,044 Is it the case that milling and pearling remove the germ from rice?—It removes much of the nourishment from the rice.

55,045. Does it remove the germ?—It depends how hard you mill it, but I really could not answer that question off hand.

(*The witness withdrew.*)

Mr. D. A. ANDERSON, of Messrs. Caird (Dundee), Ltd., and Mr. G. ERSKINE SCOTT, of Messrs. James Scott & Sons, Ltd. (representing the Jute Importers Association, Dundee).

Oral Evidence.

55,046. *The Chairman*: Mr. D. A. Anderson and Mr. Erskine Scott, you gentlemen are here on behalf of the Jute Importers Association. You have not provided us with any note of your evidence you wish to give. Would you care to make any statement at this stage or to bring to our notice any particular points as to which you think there might be improvement in the production or marketing of jute?—(*Mr. Anderson*). In the first place, it seemed to us, when the invitation was extended to us in Dundee to come here and give evidence, that it would be unwise and imprudent for us not to accept this opportunity, although later on it appeared to us that the Questionnaire which was submitted was one which we could not possibly devote our attention to, because it seemed to us to concern agriculture more than what we were actually interested in in Dundee, namely, the spinning of the raw fibre. Consequently, when we saw the Questionnaire, it occurred to us that the only clause to which we could possibly direct our attention was that which concerned the marketing of the crop. That was Clause 20 in the Questionnaire, if I remember rightly. We, in Dundee, are concerned with a large quantity of jute; I mean, we are interested in the population there, who in turn are also interested

in jute in so far as it creates an employment for them, and the whole of Dundee is really dependent upon the jute industry; that is to say, it is the staple trade there, and all other industries are ancillary to it. If the jute trade is busy, then the engineering shops and other interests in Dundee are likewise busy; on the other hand, if the jute trade is slack, then the other industries are adversely affected. Therefore, we felt that having that position prominently before us every day in our lives, it was essential for us, if possible, to bring to your notice the necessity for the quality being satisfactory in the first place, and seeing that the irregularities in the selecting grading and packing of the material were more or less eliminated. Another point, which really affects us in Dundee, is the condition of the jute when it is shipped from India and the condition of the fibre when it arrives in Dundee. Then, of course, as I have already said, the quantity is a very important thing. In this connection, there is another point to which I would refer in regard to quantity: that is the Government forecasts, two of which are issued each year. The Agricultural Department there, through Mr. Finlow, is due to give us a preliminary one some time in July; I think it is the 7th or 8th July. Then that is followed by a final forecast at the end of August or September. There is really little need for me to explain to this meeting, at this time, the multifarious uses to which jute is put; I take it you will all understand that. Jute is virtually the carrying medium for the trade of the whole world and therefore it is important from that point of view. It is used in every trade; sacks, bags, and all sorts of containers are made of jute; the Manchester trade takes an enormous quantity of jute. Then, there are our industries at home: the linoleum industry which takes an enormous quantity, and so on. The quality, however, is the first point to which I would direct your attention. It seems to us, in Dundee, that in recent years there has been a distinct tendency for the quality to deteriorate; in fact, the quality of the raw fibre to-day, in my opinion, falls very far short of what it was say ten or fifteen years ago. Whether this is due to the seed which is employed or to other agricultural conditions, I am not in a position to say. I am not aware of the conditions in India to any great extent. But, at all events, there is no gainsaying the fact that in almost every consignment of marks, the standards of which are of course very well known, (we in Dundee do know the standard marks), the quality of the standards is certainly distinctly inferior to what it was years ago. The fibre does not seem to show the same lustre, and in many cases there is not the same strength: it seems to be brittle. Formerly, also, jute lent itself to the spinning process for which it was really introduced; but, as I have said, those characteristics are now absent. It is rather difficult for us, of course, to decide as to what the reason is for this inferior quality to-day; nevertheless, the quality is inferior. To give an example of what inferiority really means to us in Dundee, I would point out that my own firm have imported something like 162 different parcels of jute this year, and of these we have arbitrated upon 96 different parcels; that is to say, we have a clause in our contract, which is rather a stringent contract, but which permits of arbitration upon the quality when we find it arriving in an unsatisfactory state, and really about sixty per cent. of the quantity of jute arrived, so far as our own firm is concerned, has been distinctly inferior and carried allowances of a very substantial nature. The allowances, for instance, on those 96 parcels upon which we have arbitrated, amount altogther to £8,400. We have had that amount in allowances on those different parcels; it is equivalent to almost 4¾ per cent. of the value of the jute that went to arbitration. I may tell you also that it is really something like 2¾ per cent. of the value of the whole of the jute which I purchased this year. That, of course is excluding rejections

and cuttings, which is a lower grade type which we import for the coarser types of yarn which are produced. I mentioned, also, irregularities of selecting, grading and packing. That point really is one which is giving spinners in Dundee very grave concern. If we had a parcel of jute coming forward, and we knew that it was an inferior parcel, we should know what to do with it; that is to say, we could probably put it into a lower grade; but our trouble to-day is that you get one bale containing satisfactory material, you get another bale containing material which really ought to be put about two grades down; and, in fact, this irregularity is not really associated altogether even with bales of different kinds; we find different materials in the same bale; we find different materials in the same strikes of which the bales are made. Now, that is a most unsatisfactory feature so far as Dundee is concerned. We have to arrange our jute and spin different qualities in Dundee, and, after all is said and done, I think you will agree that Dundee is concerned nowadays, more than it was ever in the past, in regard to quality. It is really our only feature on which we can work; that is to say, Calcutta now with their multifarious mills are producing, in quantity, the ordinary Hessians, but we in Dundee have to concentrate our attention upon specialities, that is to say, the better grades and better classes of jute, and cloth for the better classes of purposes for which those better classes of cloth are used. Then, of course, linoleum Hessians are a most important thing; they are not made in Calcutta. I daresay that is probably due to the fact that the labour in India, and you will pardon me if I say so, is not quite so proficient as in Dundee; they are perhaps more liable to carelessness than we in Dundee. That being so, the importers or the buyers of this linoleum Hessian dare not take risks where cloth is made up into lengths of something like 1,800 yards, about a mile; if you have a flaw in that sort of cloth, you can imagine the sort of loss it would occasion to the linoleum manufacturer, because the whole of his plant is immediately stopped, his mixing is all in a mess, and, generally speaking, he has to scrap the whole length. Those irregularities, therefore, are features which we distinctly object to at the moment; I am afraid they are becoming worse and worse as years go on. Why it is I do not know; nevertheless it is there. The next point which I should like to refer to concerns the condition. We all know that jute, as a fibre, contains a certain amount of natural moisture; in fact, it has been gauged very carefully, and we find that the extent of moisture in jute is roughly about twelve per cent.; that is good enough for all purposes. *Deshi* jute, of course, contains more moisture than the white jute from the Dacca districts. That moisture we know; but what concerns us is the amount of *aqua pura* that is put in in India. Whilst creating a great deal of difficulty with us in Dundee, in that we have to pay for water as well as for jute, it has also a serious effect upon the fibre itself, which is very much more important. Jute, as you know, is packed in very hard press-packed bales of 400 lbs. with hydraulic pressure. If it is packed in this very wet condition in India, then what happens during the voyage? It is a long sea voyage which takes really a month from India to the United Kingdom. We find that the jute itself tends to heart damage and to mildew, and we have serious consequences here on that account. If we find, for instance, that the jute has not actually heart-damaged, or has not actually mildewed, nevertheless, it loses a great deal of that splendid quality which jute ought to possess, and instead of having a bright lustrous fibre which we should expect, it is discoloured and becomes dull, and in many cases becomes lifeless fibre which is not suitable for many of the purposes for which jute is used in Dundee, for those finer classes of work to which I have already referred. Another point which concerns us in Dundee, and this of course is a very important one, is the quantity. Unless we have a large quantity of jute, we must have a high priced article. Jute, being the cheapest textile, must of necessity be

at a very low price, otherwise we cannot compete. There are so many other textiles with which jute more or less competes. For instance, cotton to-day is at a fairly moderate figure. Last year, jute rose as high as £70 per ton, but by the end of the year it dropped to £30 per ton. Now, we have to buy jute; it is a seasonal crop; we have to buy most of it between July, August, and the end of the year. We do that for various reasons; early jute has colour and various other features which the latter fibre does not possess. We imagined that we had a very substantial margin upon our purchases last year, when the margin even went to the extent of probably £15 to £20 in our favour; that is to say, although jute dropped £15 or £20 per ton, we might have had a substantial margin there to work upon. Instead of that, it fell in some cases even over £30 per ton, and we found that then we were left with jute, which meant to us of course an enormous loss, having bought large quantities for our own consumption during the year. Our own consumption for our own firm is something like 60,000 bales a year; that is 12,000 tons. A very simple calculation will show you what sort of loss we had to face at the end of this past year. I say that, because I feel you will agree with me perhaps when I say that jute must therefore essentially be a cheap article. If jute rises substantially in price, the buyers of jute goods are faced with a problem also, and they almost invariably adopt a hand to mouth policy with their buying. The consequence naturally is that the jute trade in Dundee becomes slack, and, as I have already said, all other industries become slack in Dundee, and Dundee then is on the verge of despair. In regard to quantity, I would say further that the quantity is indicated each year by the Government through the Director of Agriculture. But these reports are not altogether what they might be. The Government forecast for 1924-25, the preliminary forecast, was something like 2,700,000 acres; the final forecast exceeded this by something like 40,000 acres. The first forecast, I may tell you, is issued entirely in acres, but in the final forecast, while it is also issued in acres, an estimate of the crop is also given. For this final forecast of 1924-25 the yield was indicated at 8,000,000 bales. I do not know why it was done, but at the final forecast the Director of Agriculture saw fit to revise his acreage, and he increased it by something like 80,000 acres, and, instead of the actual outturn of the crop being something in the vicinity of 8,000,000 bales, it was nearer 9,000,000 bales. Now I will come to 1925-26, when the position is worse. In 1925-26 the preliminary forecast was 2,900,000 acres; the final forecast exceeded that again. We were told, at that time, that the Director of Agriculture had taken great pains with his acreage on this particular occasion, having revised it on the previous occasion; but again he apparently under-estimated his preliminary forecast and now he had to put on something like 14,000 acres and he indicated the yield of the crop at 7,800,000 bales. But once again, apparently, he had not taken sufficient pains, because instead of keeping to his original acreage on his preliminary forecast, he decided to revise his acreage again and he gave it as 3,100,000 acres instead of 2,900,000.

55,047. *Dr. Hyder*: Plus 14,000?—Yes, plus 14,000. But instead of the actual outturn in crop being 7,800,000 bales, which was the yield indicated by the Director of Agriculture then on his final forecast, the actual outturn came to fully 9,000,000 bales. Now, I will come to this present season, and I think this is going to be even worse. The preliminary forecast on last year, 1926-27 was 3,600,000 acres; but again his final forecast in acres was increased and he issued a figure of 3,629,000, or almost 3,630,000 acres. The yield was indicated at 10,888,900 or almost 10,900,000 bales, and at the end of May of this year we find that 11,825,000 bales have already been accounted for, with another month to go. Now I submit that in those estimates, however desirous the Director of Agriculture may be to help the trade, he is doing entirely the reverse, because he is opening

up the gate wide for all classes of speculators to come in and speculate upon paper. We find that not only is there the *Bhita* Bazaar in India, but we find a very strong *Bhita* Bazaar in London here, the members of which never see jute, unless the bales have been sent up here for arbitration purposes, having been sold on a London contract, because the bad bales have to be sent to London for arbitration. That is the only jute they see; all their contracts are scraps of paper, and it might as well be a stock exchange instead of a jute exchange. I think you will see that this speculative element, which is really growing in the jute trade, is one which is really very bad indeed for the Dundee trade. It is helped very greatly by those erroneous reports and estimates of the crop which are issued each year by the Director of Agriculture. We should much prefer having no indication of the crop at all rather than an erroneous one, because it is absolutely misleading to everyone in the trade. We should find ourselves on, I think, a better basis, we could really work better as we could gauge our own requirements better, and we should not have this speculative element which, after all is said and done, affects Dundee to a very great extent: more even than Calcutta. You may say: "Why do not you speculate yourselves"? Well, we have to speculate, unfortunately, because it has become a speculative trade. Time was, on the Dundee jute market, when we could sell cloth and yarns and after we had sold perhaps 100 tons of either yarns or cloth, we could say: "I will cover that with raw jute." Time was when you could do that and make ends meet and probably make a profit. Now, if we were selling yarn at to-day's price of about 2s. 11d. to 3s., which represents something like £40 10s. per ton net, we would require jute at £24 10s. to make ends meet; that is to say, we allow £16 for spinning. But to buy jute to-day at the lowest price for a good mark you have to pay £34 to £35 for it. That is where our speculation comes in. We are now approaching the season when we must buy jute willy nilly, because it is coming to the new season; that is to say, jute is cut in July and marketed in July and August. We have to buy the jute and imagine that, later on, our prices may improve and permit us to make a profit or, at the worst, make ends meet; but we cannot do it to-day. That is due to this speculative element, more or less, in the market: this *Bhita* Bazaar in India and in London simply speculating on the market and ruling the market. You might say: "Why do not you make your own market values"? We cannot; Calcutta is too big. Calcutta is a big consumer of jute. Of a crop of 8,000,000 or 9,000,000 bales they consume about 6,000,000 while we in Dundee only consume 1,000,000. Consequently in Dundee the purchase of a million bales has very little effect upon a market where we have another centre consuming 6,000,000 bales. You may say: "Why do not you make a price for Hessians"? Well, we cannot, in face of the big production in Calcutta. We try to get a better price for our product because we think it is a better product; there are less flaws; but nevertheless, the Indian price both of raw jute and goods has an effect on the market price of jute goods in Dundee and raw jute in Dundee, and that is why it is rather difficult for us. These are points which I have mentioned, but I shall be very glad to answer any questions you care to put.

55,048. *The Chairman*: Does your firm in Dundee as a rule buy in India?—No, we buy in Dundee through brokers in Dundee; they do not ship but they are the direct agents of shippers.

55,049. Are shippers represented on your organisation, the Jute Importers Association?—We have shippers of jute represented here. As a matter of fact, my colleague here to-day, Mr. Scott, is also a shipper in India.

55,050. Do you bring points concerning quality to the notice of the Agricultural Department in Bengal?—We had an opportunity of doing that last year when Mr. Finlow was in Dundee; and we had an opportunity of meeting Mr. Finlow with Mr. Lindsay of the India Office. We then spoke

to him quite strongly, though in quite friendly fashion, of course, about the returns and also about the question of quality.

55,051. But, as an organisation, you are not in touch with the Agricultural Department?—We are not in touch directly with the Agricultural Department.

55,052. Is the jute interest in Great Britain represented by any organisation which is in touch with either the Government or the Agricultural Department in Bengal?—I think not.

55,053. You mentioned, in the course of your interesting remarks, that you thought you observed a deterioration in the quality over the past ten or fifteen years. You quoted, in support of that, the fact that out of 162 lots that you had bought you had arbitrated on no less than 96. Is that a much higher percentage of arbitration on lots purchased than you were accustomed to have years ago?—Yes, infinitely higher. We used to depend on getting parcels of jute in, there were known standards, and the standards which came forward were the type of jute which we expected to find by the marks. We had occasional arbitrations, but not to the same extent as we are experiencing now.

55,054. Are you satisfied that there has, in fact, been a deterioration and that what seemed to you to be a deterioration is not due more to a change in the practice of spinning in Dundee: a change from coarser work to finer work?—No, the standards of jute were used for those particular purposes for many years.

55,055. So that you are measuring the jute against fixed standards and not forming your opinion arbitrarily?—Not from a spinning point of view, no.

55,056. It is the case, is it not, that the material spun in Dundee has changed its nature a good deal since the War: that rather a different quality of material has been woven?—No, I would scarcely say that; I mean, our standards in Dundee have always been superior to those produced in India; but our difficulty to-day is that the mills in India now are also competing in some of our markets and they, in India, are producing better qualities than they hitherto produced.

55,057. Is it not the case that, in recent years, Calcutta has done more and more in the coarser grades and Dundee has concentrated more and more on the finer grades?—In Calcutta they have always concentrated on the coarser grades; but they are making a better cloth to-day than they did some years ago. Our trade in Dundee has really not altered to any appreciable extent, so far as quality goes.

55,058. But the Indian jute mills have been considerably strengthened by the War and post-War circumstances, have they not?—Yes, and we find also that some of the consumers of jute cloth in the United Kingdom to-day are continuing to use gunnies, that is your Indian product, when prior to the War they consumed almost exclusively Dundee products. During the War, of course, it was very difficult to get Dundee productions, because we were under the War Department; we were commandeered, so to speak, and we were producing goods for our own armies. The Calcutta goods then were taken up by the consuming centres here and they have perhaps discovered that the Indian quality of goods is in a way suited to their purposes, not all their purposes but some of them, and they have continued to use that class of material.

55,059. In Calcutta, spinning and weaving are usually carried out in the same establishment, are they not?—Yes.

55,060. Whereas, in Dundee, the functions are divided?—Not always. My own firm do spinning, weaving, finishing and packing. There are, however, firms who spin alone and there are firms who weave alone; but I should think the bulk of our association, I mean from the point of view of number of employees, are both spinners and weavers.

55,061. Is there any import, into Dundee, of spun jute?—Yes, we have spun jute imported from Belgium and from France.

55,062. Not from India?—No; the woven jute, of course, comes from India.

55,063. Does any jute enter Dundee grown in countries other than India?—We had samples, some years ago, of Egptian grown jute but it was not satisfactory; it did not suit the purpose; it was not a success. The only jute which is really suitable is the Indian jute.

55,064. In the meantime, the monoply is complete?—Quite.

55,065. At the same time, it is important to you that quality should be maintained?—Quality should be maintained; that is essential.

55,066. You are representing spinning and weaving; is it as important to those who purchase and ship jute that its quality should be maintained, or are such persons and firms mainly concerned with turnover and the margin of profit which they can make?—I should think their main concern is turnover and profit on any broking business they conduct.

55,067. So that, broadly speaking, it is you gentlemen in Dundee who weave and spin, who are mostly concerned with the factor of quality?—Quite.

55,068. At the same time, it is the shipper who is least concerned or who may be less concerned than you are, with the factor of quality, who is more closely in touch with the merchant and so the grower in Bengal, is that so?—That is right.

55,069. Does it not occur to you that it might be worth while to get yourselves, as representing spinning and weaving, into closer touch with the cultivator who grows the jute and whose practice controls quality? Have you envisaged the possibility of some such organisation being set up which would enable you to bring the technical requirements of your industry to the notice of the Agricultural Departments, of the primary collectors, distributors, and, of course, of the cultivator himself in Bengal?—We have not considered it to any great extent, but I daresay that, as an association, we can quite well see that that would be an ideal situation. Our difficulty to-day, however, is that we have no contact, we have no direct communication with the actual grower of the jute. The grower of the jute, so far as we understand it, is more or less in the hands of the different people through whose hands the jute passes before it actually even arrives at the shippers.

55,070. Who are concerned, in the main, with quantity and satisfying the demand?—Yes.

55,071. Not with quality?—Not with quality, I take it. I do not know how many hands it passes through, but I should think perhaps Mr. Scott can tell you: probably six or seven different hands; but I daresay you gentlemen would know yourselves.

55,072. And so long as the supply of jute is capable of satisfying the demand, the middlemen and the shipper are not concerned even with quantity?—I daresay; he is of course out to make as much as he can in whatever way he can. If he can buy jute at a certain price from the ryot or from those different people who buy it from the ryot, and make sufficient turnover in the process, I think that is his main concern. His concern is really not as regards the manufacturing of that fibre into yarns and cloth.

55,073. From the cultivator's point of view, if the market for jute can be satisfied from a smaller acreage by a higher out-turn per acre, the cultivator would have more land upon which to grow other crops; but, naturally, that consideration is not a concern of either the middleman in jute, or, for that matter, of the shipper?—Quite. The middlemen in jute are concerned with this speculative element which really has crept in. When the jute forecasts are issued now it seems to me, at all events, that, so far from being correct, they are more or less cooked. I mean, it apparently suits one man or one section of men to say that the acreage or the yield is to be so and so, and he makes it his business, then, to have the market on such a basis as to suit himself; it really does not concern him whether we get jute

at a reasonable price or not. Over a series of years, we have known that the actual annual consumption of jute in the United Kingdom, or in fact, in the world, is, I think, a little more than 8,000,000 bales. When we had an indicated yield of less than 8,000,000 bales, as happened in 1925-26, it was immediately recognised that this was a famine crop; the price consequently rose and rose enormously; it rose to something like £70 per ton; but the actual out-turn of the crop exceeded 9,000,000 bales. Jute, therefore, dropped at the end of the season; but it was kept up during the running of the season by those speculators, on the figures which they received from the Director of Agriculture. The same thing held good last year; here was apparently a crop which, according to the final forecast, was to be something like 11,000,000 bales: an enormous crop, exceeding the consumption of the world by at least 2,000,000 bales; in fact it exceeded the average on a period of years by 3,000,000 bales; but what happened? The first scare that went out was: no steeping water, crops all damaged, there are to be none available. Those were the sort of stories that went round, with the result that prices were maintained. Then we find, still with a month to run of this year, that instead of being even 11,000,000 bales it is about 12,000,000 bales.

55,074. *Mr. Noyce*: Has there been a drop in prices?—Yes, there was a drop in price last year.

55,075. I mean recently?—It is fairly level; it is tending to go up again. That is the trouble to-day; the information we are having this year in Dundee is that the crop is quite satisfactory, but periodically, every other day, you will find a cable coming in: No water, no rain. Another day it will be: Too much rain. This is the sort of information we get. The jute market in Calcutta, London and Dundee is like a barometer, it goes up and down; but the speculators are successful in maintaining their position to-day and "bulling" the market to such an extent that they are not allowing it to drop.

55,076. *Professor Gangulee*: Do these cables emanate from the Director of Agriculture?—No, they come from Reuter.

55,077. *The Chairman*: You have pointed out the importance of quality to the Dundee trade; you have also told the Commission that it is the spinners and the weavers who are concerned with this factor of quality, rather than the middlemen and shippers; do you think the jute interests in Dundee would be prepared to take a hand in some organisation set up in Bengal, designed to carry on research and propaganda amongst cultivators and reinforce the activities of the Agricultural Department in the Province?—I cannot say speaking for the Association, but I should think they would favourably consider any such scheme that was put before them.

55,078. Have you considered, at all, any manner by which an organisation of that sort might be financed?—We have not really considered the matter at all; but there is one point that I think perhaps might be of interest; that concerns Mr. Finlow's visit to Dundee in connection with the quantity of seed available. At that time he gave us very strong information and was rather alarmed about the seed problem; this was just before 1926-27. In fact, he really indicated to us that if we did not support him in this Government departmental seed distribution, that he feared the crop would simply dwindle away. This was really in view of his former report: that is the yield of 7,000,000 for 1925-26. I do not know what steps he took or what success he achieved in regard to his distribution of seed, but we did not subscribe to that scheme, and, notwithstanding that, we found that in the year immediately following his visit, instead of the crop being less, it was something like 3,000,000 bales more. I do not know whether there is any call for us to give any more seed; it seems that he has got enough. I have, here, a note in connection with a meeting which took place with the Indian mills in Calcutta; the mills there gave a guarantee of something like £5,000. There has been some expense this past year with the seed

distribution and therefore they, as an association, have a liability of £525. But the mills in India are really not very keen upon continuing this, according to the report of the meeting with Mr. Finlow and the Committee of the mills. This meeting was on the 11th May of this year.

55,079. Is it the case that jute is held over from one crop to another in the case of a surplus?—Yes, they carry over from one crop to another; there is always a carry-over.

55,080. Are you always aware, when you are purchasing jute, whether it is the current season's crop?—Yes, we can distinguish that; we know whether it is new crop or old crop.

55,081. You mention various points under the head of condition: moisture, method of packing, cleanliness and so on. Is that a direction in which a good deal of improvement might be effected?—Yes, but I think it is really the press houses which have to look after that, and the shippers themselves. It more or less rests with the dealers and shippers. But I mention that simply because, in this Questionnaire, there was a clause dealing with marketing.

55,082. I was going to suggest to you that if it were possible to set up some such organisation as we were discussing just now, these subjects might very properly come within its ambit?—Yes.

55,083. Can you give the Commission any indication as to the point at which the price of jute, if it rises, begins to admit other fibres?—It depends upon the position of the other fibres.

55,084. You mean the price of the other fibres?—Yes. If, for instance, jute rises to a level again of £70, and cotton, of which we understand there is a big crop this year, fell to a very low level, then the question of competition becomes rather acute between the two textiles. You see £72 per ton is 8d. per lb. net. That brings us up to £100 per ton for the produced cloth.

55,085. *Mr. Calvert*: But cotton would not compete with jute for all purposes?—No, not for all purposes.

55,086. *Professor Gangulee*: Is there any other fibre which is likely to compete at any time?—I do not think so, unless hemp, which has been very cheap of late; for a certain period of this past year, hemp was very cheap and they were able to buy hemp yarns, which, of course, are infinitely stronger than jute, and, probably from that point of view might be purchased instead of jute when jute was at a high price. But, another point that really concerns jute when prices are high, is the extent of the second hand trade. When jute reaches an abnormal height, then you find that the door is opened again for the second hand trade coming in. When jute is about 4d. a yard or less, there is no inducement for a man to use sacks and bags twice, because of the expense involved in mending and preparing the used article for use again; but when it comes up to double that price, 6d. or 7d. a yard, as the case may be, then it would pay the second hand man to come in and mend and generally prepare the used article for use again, all to the exclusion, of course, of the producer of fresh goods.

55,087. *The Chairman*: Are you aware that there has been a proposal to start jute growing in Java?—I am not aware of it.

55,088. *Sir Ganga Ram*: When was the export duty levied? Only four or five years ago, was it not?—Yes, I think so.

55,089. Has that export duty made any difference in the quantity of jute grown?—I think not; I think it is a very small duty; I am not sure of the duty.

55,090. It has not made any difference to the growth of jute?—Not a great deal. You mean in quantity?

55,091. Yes?—I think not.

55,092. You do not rely on the forecast of the Agricultural Department; you have your own agencies, I suppose, to give you correct information from time to time?—No, we have not; we rely upon the forecasts.

55,093. Have not you your own agents to give you reliable information from time to time?—No, we do not have agents there.

55,094. Do your interests clash, in any way, with those of the Indian mills?—In some ways; we find that their goods are used where Dundee goods were formerly used. They do clash to a certain extent.

55,095. Is the United States a good customer of yours? Have they started making bags now from cotton?—In ordinary Hessian trade the United States business is not so large as it was years ago; they are not buying Hessians; but we in Dundee rely to a great extent on the United States for the purchase of linoleum Hessians; we are the main source of their supplies of those articles.

55,096. I know the Indian mills now do a large trade with the United States?—Yes, in Calcutta Hessians, but not in linoleum foundations.

55,097. *Sir Thomas Middleton*: Have you any interest in linen?—None whatever.

55,098. I have no doubt you are aware of the fact that the linen industry have organised a research association in this country; you have got some members of that association in Dundee?—Yes, I understand that has been done.

55,099. The linen industry did that in order to improve the quality of of the fibre in which they were specially interested?—Yes.

55,100. You, in Dundee, are interested in getting a good quality of jute? —Yes.

55,101. The lower qualities are absorbed by the Calcutta market. What does Dundee pay for jute in a year?—Roughly, I would take it that Dundee consumes something like 1,000,000 bales; that is 200,000 tons, at £30 a ton on an average; that is £6,000,000.

55,102. Has it occurred to people in Dundee that they might form an association, of the type that the linen industry has formed, to look after their own interests in the district in which jute is grown, to see that the forecasts are carefully made and that the right quality of jute is being produced for your purpose?—I daresay, if it were possible to do so, we would welcome such a scheme; but we imagined, of course, that, being a Government forecast, it would be more or less accurate. I understand now that the methods which are employed in the accumulation of all the data for this is that they are really obtained through the local policeman.

Dr. Hyder: That is the chief source of information.

55,103. *Sir Thomas Middleton*: What strikes me is this: Calcutta people appear to have evinced no special interest in quality while you are showing much interest in the quality of the jute?—Yes, because it is really a very important point, so far as we are concerned. Is it really not very difficult when you consider the position of the ryot or the small farmer. You have fully 3,000,000 acres each year under cultivation, and probably the number of fields involved would be about three to four fields to the acre; I mean I understand that each ryot has small patches of ground. That would be a very great difficulty.

55,104. But still, the point remains that you have a very great stake in this subject, and it does not seem to me that Dundee is taking any action to look after its interests in the growing districts of Bengal?—Our chief difficulty was to know what action could be taken; but, I daresay, if it were possible, if there were means by which we could take a closer interest, that would receive the very favourable consideration of the Jute Importers Association in Dundee.

55,105. You have got, in this country, a Linen Research Association; that is one type of association; in India you have a Cotton Committee which has been formed to look after the cotton interests; and I am suggesting

to you that something might be done in the way of setting up a jute association to look after these questions in which you in Dundee are directly interested?—I think we should certainly favourably consider that, if it were possible. Do you mean that we would then get into closer touch with the actual grower of the jute ourselves?

55,106. Undoubtedly, if you were represented in Bengal on some kind of association?—What about the middlemen then who are at present really interesting themselves in all this speculation and this gamble with the poor ryot, who, I daresay, gets very little for his production; it really goes into the pockets of the middlemen.

They might come into your association; that would be for you to decide. I do not think they have come into the Linen Industry Research Association to any extent.

55,107. *Sir Ganga Ram*: You could easily become the middlemen for that purpose?—I daresay we could; we should probably find it of advantage.

55,108. *Sir Thomas Middleton*: In the case of the linen industry, the traders themselves have put down a certain sum and they have earned a Government grant; you can easily ascertain what the position is by making an enquiry of the Secretary of the Linen Industry Research Association, Belfast?—Quite. Even at present, I daresay, there are conflicting interests in the baling and shipping of the jute; you have in one case the Baled Jute Shippers Association, and then you have the Calcutta Jute Balers Association; I think those interests are really not just pulling together as they might be.

55,109. You emphasise the extent to which Dundee depends on jute, and I am only putting it to you that Dundee ought to look after its own interests in Bengal?—We should like to very much if we had had an opportunity, but we have been debarred from taking an active interest in the jute industry in India, so far as we are concerned with regard to quality and quantity.

55,110. *Mr. Noyce*: What is there to prevent you establishing your own buying agencies?—I question whether it would be prudent, in the first place, for us to establish a buying agency when we are only really buying one-ninth of the crop; we should be swamped by the other interests in India who are consuming to the extent of 6,000,000 bales a year, and the rest of the world, say, another 2,000,000 bales.

55,111. *Sir Thomas Middleton*: Do not you want to pick a special quality? You want to get the pick of the crop of 9,000,000 bales?—We want to get the pick if that is possible, but we also want to get it as cheaply as possible; otherwise we are going to be knocked out of competition altogether. One essential factor in connection with the trade in Dundee is that we have to compete against India in many things, although there are specialities in regard to quality which are made in Dundee and which are not made in India; but we have a freight from India to Dundee for raw jute to contend with, and then we have a freight for our produced articles, say, going to South America and the United States, whereas there is only one freight involved between India and the United States, as there is from India here. We have really a double freight to pay.

55,112. *Dr. Hyder*: You have got competitors on the Continent of Europe?—We have competitors in some of the mills in Austria and Germany.

55,113. I expect you know Bischofswiller. Do you know whether anything is happening on the Continent of Europe in this search for substitutes for jute?—No, I have not heard what is being done to-day; but, of course, there have been efforts made from time to time to substitute jute in the form of paper yarns and so forth.

55,114. From French Madagascar, French Indo-China and French West Africa?—You mean the growing of fibre there?

55,115. Yes?—I do not know about that.

55,116. I think you had better look out that way?—Is that so?

55,117. With regard to this question of forecasts, it seems to me there are three things involved: firstly, there is the question of area; secondly, there is the question of the standard yield; thirdly, the allowance to be made, this way or that way, for the condition of the crop. Now I think the Director of Agriculture can help you as far as the latter two factors are concerned: condition and average yield; but he cannot help you with regard to acreage because there is no land revenue establishment in Bengal; they have got to go to the policeman?—He has to rely on that information, accurate or inaccurate?

55,118. Yes. You are of opinion that these violent fluctuations in the price of jute are, to a large extent, due to these erroneous forecasts?—I think they give a great deal of scope to the speculator.

55,119. He makes use of that?—Yes.

55,120. *Mr. Noyce*: With reference to these violent fluctuations in the price of jute, is there any system of hedging in jute, as there is in cotton?—Yes. I will give you an indication of what really has happened quite recently. When jute, for instance, started to fall a bit, when there were indications of a big crop this year, there were some speculators who held perhaps some stocks of old fibre at higher prices than what was likely to be the price of new crop. Such a holder might say to himself: I am holding this at £40, I will sell new crop at £30. If, then, the new crop raw jute goes down, he can cover his £30 sale at something less and so hedge, or make some little profit on that particular sale as against the loss which would accrue on his holding of old crop. That is really repeatedly done; this hedging process goes on all the time. This is the speculator's market; that is the sort of *Bhita* Bazaar we were up against.

55,121. I was thinking of the hedge contract system in Liverpool, the object of which is to enable the manufacturer to avoid speculation as far as he is concerned?—We do not have a Futures market. You buy for instance to-day; it may be somebody is prepared to "bear" the market, and although the market is £34 or £35, he might say: I will sell you August and September at £33. He "bears" the market to that extent.

55,122. So you cannot really protect yourself against fluctuations in the way that the cotton manufacturer can?—No, we have a definite contract system; we have a shipment contract and a spot contract which are really agreed upon contracts between the shippers association in India and the Jute Importers in Dundee. It is a stringent contract. I am sorry I have not a copy of it with me.

55,123. Do you work, at all, with the Calcutta Jute manufacturers?—No, we do not work with them. Our interests are different.

55,124. In regard to the falling off in quality, do you think that may be due to the fact that the Calcutta people being on the spot get the best, and you get the worst?—No, I do not think so. There, there are European shippers who have an interest in Dundee as they have in India; we buy, for instance, from native dealers, from European dealers; we buy from all classes of people. The jute marks, as you are probably aware, are multifarious; they are legion, there is a book of them. And there are certain known standards; these we buy and expect to get. The difficulty is that there are mixtures that crop up from time to time in the packing.

55,125. You mentioned double freight as a handicap; have you actually worked out the extent of the handicap?—I had occasion to do so, recently in connection with cotton. I found that the freight on cotton from Bombay to Japan, and on cotton piece goods from Japan to Bombay, amounted to exactly the same as the railway freight on a journey of 300 miles in India.

55,126. So that the effect of the double freight was obviously very considerably exaggerated in regard to cotton?—I have not worked it out from that

point of view. I only go upon the prices which are quoted for, say, a Calcutta Hessian C.I.F. New York from Calcutta, and a quotation which I was given from Dundee C.I.F. New York, and they are about the same. Consequently, the freight on our raw jute coming to Dundee must be taken into account as an extra in the cost of shipping our manufactured jute to New York.

55,127. *Mr. Noyce*: But you have not separated out the element of freights; the C.I.F. price includes the cost of manufacture and everything else?—They will quote you a Calcutta price C.I.F. Dundee and C.I.F. New York, and they are both the same. That is to say, you can buy Calcutta goods C.I.F. Dundee at the same price as they can buy C.I.F. New York; consequently we have an extra freight.

55,128. *Professor Gangulee*: Have you any source of information with regard to crop conditions, other than from the Government forecasts?—We have no reliable information, other than that from time to time the jute shippers may or may not give some idea of the crop conditions, and so forth; it is more or less unreliable.

55,129. In view of your criticism of the forecasts, do you think they should be discontinued and the trade left to organise their own reporting agencies?—No, I would say that if they cannot be more accurate we would be better off without them altogether.

55,130. Do you find that the jute rates are largely governed by these official forecasts?—Yes, I think so; the speculative element is really just waiting on those rumours (you can only call them rumours) with regard to the condition of crops and so on.

55,131. Do you think the absence of any forecast would help to stabilise the price?—The preliminary jute forecast comes out between the 7th and 9th July. For a week before that comes out there is nothing done on the Dundee market; everybody is simply hanging about wondering what is going to happen, and very often it has happened beforehand; I mean it is all discounted, and then we are just where we were.

55,132. *Mr. Noyce* referred to the violent fluctuations in the price of jute; have you any information as to what extent such fluctuations affect the production of jute?—Do you mean the production of the fibre?

55,133. Yes?—I cannot say.

55,134. From year to year, if the cultivators get a good price and the market is fairly steady, they are inclined to grow a bigger and better crop?—Yes, but then again it cuts both ways. If you have a big crop, then you will get a smaller price for your fibre, while if you have a small crop you will get a higher price for your fibre. I can only surmise that this is the idea, that the ryot who is probably dependent upon the money-lender in India is told that if he has, say, an acre under cultivation, he should put in three-quarters of an acre or something of that sort; that is his idea of the area in order to keep the price up.

55,135. We have been told by another witness that the quality of the jute taken by Dundee, as compared with that taken by the Calcutta mills, is like this, that the Dundee people buy mostly Northern Bengal jute, and not very much from Eastern Bengal; that is the export jute trade is mostly carried on in soft jute fibre; is that what you buy?—Mostly; I prefer North Bengal jute myself because it is soft.

55,136. Recently, as you know, the Department of Agriculture, Bengal, has paid considerable attention to the quality of jute?—Yes.

55,137. They have now a variety known as *kakya*, which is extensively grown in some parts of Bengal?—Yes.

55,138. In your market you do not recognise that quality?—I do not know that quality. (*Mr. Scott*) Dundee buys on a mark and not from a certain district; the baler in Calcutta buys from a certain district.

55,139. So that what is now advertised as being an improved variety of jute is not known in the market here?—Not known as a separate mark.

55,140. With regard to excessive moisture, how much do you allow?—(*Mr. Anderson*) Roughly, we would estimate that in jute it would be about twelve per cent. in *deshi* fibre; that is, I think, the fibre which carries most natural moisture.

55,141. I think you said you buy from various dealers and not from any central organisation in Calcutta?—No.

55,142. You buy from both Europeans and Indians?—Yes.

55,143. Is it your view that the watering of the bales, that you refer to, is done by the cultivators?—No, I do not think it is done by the cultivators. (*Mr. Scott.*) The cultivators water the jute before it comes to the press houses in Calcutta; I have actually seen it with my own eyes, going to the *hats* up country, the boats pull alongside the river bank, unload it, water it with a watering can, and then put it back in the boat again. The balers try to dip the jute, but the weather does not always permit them to dry it, and once water is added to the jute it ruins the fibre as far as the spinner is concerned.

55,144. Lately, co-operative marketing of jute is being encouraged in Bengal; how would you view such a movement? Would you be prepared to deal with these co-operative organisations direct?—(*Mr. Anderson.*) It depends really what the co-operative movement is; I do not know it.

55,145. That is a movement aimed at the limitation of selling and buying competition?—(*Mr. Scott*): Is not that to cut out the moneylender? (*Mr. Anderson*): To cut out the middlemen?

55,146. Yes?—If it were to benefit Dundee I should agree with it. I have really no knowledge of the system and consequently I am not in a position to say.

55,147. You would perhaps be able to find a co-operative organisation which would satisfy your requirements in the line, say, of grading and packing, control of moisture and things of that sort? Would that not be advantageous to the trade?—(*Mr. Scott*): But are the co-operative organisations to pack the bales or just sell it?

55,148. Yes, they are baling now; they deal with the local European dealers in Calcutta?—Hand packed bales?

55,149. Yes?—They do not bale 400 lb. bales though?

55,150. They are just beginning; they are proposing to have a big baling arrangement. In that case they would like to deal direct with the consumer, that is, the export market. That would eliminate many middlemen. I should like to know what is your view on this question of co-operative jute marketing?—(*Mr. Anderson.*) I am afraid I cannot express an opinion on that, because I really do not know what they have in view and how it would affect Dundee; it is rather difficult. (*Mr. Scott.*) I think that movement will benefit the grower of jute more than it will the baler or the consumer.

55,151. *Mr. Calvert*: I should like to have this question of quality versus price cleared up. I gather that there is no rival fibre which a lowering of the price of jute could eliminate?—(*Mr. Anderson.*) No.

55,152. You cannot go further down?—No, it is the cheapest textile.

55,153. And, going upwards on the question of quality, if quality means too great an increase in price, then you come up against cotton?—Yes.

55,154. So that, really, there is a very narrow margin in which you can get quality if combined with a higher price?—Yes, we do not buy on a big margin in that sense; that is to say, you must have it cheap; if you get it too dear, then you are up against other competing markets.

Messrs. D. A. Anderson and G. Erskine Scott.

55,155. There is not much scope for improving the quality if improved quality means higher price?—No, that is right.

55,156. *Mr. Kamat*: With reference to your complaint about the Government forecasts, are you aware that the Director of Agriculture at Calcutta is assisted by a Forecast Committee?—I was not aware of that.

55,157. We have it in evidence here. Mr. Morgan, for instance, who is a broker and Chairman of the Brokers Association, Calcutta, was himself a member of the Jute Forecast Committee to assist the Director of Agriculture. So that, you will see, the forecast is not the official forecast of the Director of Agriculture alone; the trade is associated with the Director of Agriculture?—Which trade?

55,158. Or, at any rate, the brokers?—That is not the trade.

55,159. If you are not satisfied because only the brokers are represented on this Jute Forecast Committee, the only other suggstion, which might perhaps satisfy you would be that the buyers should be represented on that committee?—Yes.

55,160. If this advisory committee is made a little more representative than it is at present, would you be satisfied?—It is not a question of whether I would be satisfied with adequate representation from the trade on this committee; it is simply a question of having the forecasts more accurate. If that would be a means of arriving at more accurate figures, then it would satisfy me. I am not concerned with who is on the committee or who is responsible for the production of the figures; what I am concerned about is that the figures produced should be correct figures, or approximately correct figures.

55,161. What the Government of Bengal is concerned with is to have as correct a forecast as possible, and to attain that, they have done everything that was possible. There are many factors which might throw the calculation out, so that it is not possible to have an ideal forecast?—I am not upbraiding them, in any way, in regard to the desire they have to provide satisfactory forecasts; but it seems to me that although they have done everything possible, the forecasts are still unsatisfactory. It may be quite impossible for them to do anything better. Consequently, I say, if it is impossible for them to do anything better, rather than put out such an erroneous forecast, stop it altogether and save the money.

55,162. A second point which has emerged in the course of this evidence in India is this: Mr. Morgan has told us that, in his trade at any rate, the brokers do not depend entirely on the Government forecast; whatever the forecast may be; they have private sources of information as to the jute growing, and they depend on these private sources in addition to the Government forecast?—Yes. Mr. Morgan represents one firm; but there are a great many different firms, and the trouble with Dundee is that you get all sorts of information from all those different firms as well as the Government forecasts, and we never know where we are; that is our trouble.

55,163. But, just as dealers in India do not take the Government forecast as gospel truth, what prevents the Dundee people from doing the same, having also private sources of information?—That is our difficulty. Again, we do not take it as gospel truth; from our own past experience we feel it would be quite wrong to take it as gospel truth; but we are then left in a dilemma as to what to take: whether we should take that or some other course which is also indicated by the other sources of information from these different brokers; we are left with a maze of information.

55,164. There is, in Calcutta, a Jute Balers Association?—Yes, that is right: the Calcutta Jute Balers Association; it is composed mostly of Indians.

55,165. The jute comes from various middlemen in small quantities, and it is not possible to have a uniform quality while jute is coming in from small fields; but what prevents the Jute Balers Association from sorting

out to a uniform quaility before they bale and send it out here?—That is really their duty, and they are failing in that duty.

55,166. Your complaint that the quality is not uniform probably traces the whole fault to the Jute Balers Association?—Yes, there may be a great deal in that; that is why I said that I did not know what was the reason of the quality not being uniform. I was really concerned with the fact that it was not uniform, and I wanted some alteration if possible in that direction.

55,167. Would you now agree that there is something which the Jute Balers Association have to do to remedy matters, rather than the Agricultural Department or any other organisation in India?—Yes, I quite agree, they are really at fault to a very large extent, and that is why I mentioned it, because it came under this clause on marketing, and they are implicated under this particular clause.

55,168. Well then, so far as the improvement of the actual strain and the quality of jute is concerned, as Sir Thomas Middleton has pointed out, it is for the trade here to organise themselves on the lines of something like the Central Cotton Committee in order to have better research for the improvement of jute?—Yes.

55,169. In fact, about all the three points you raise it is for the trade, mainly, to take up the matter and organise themselves?—Yes, I quite agree.

55,170. *Sir Ganga Ram*: Are you aware of the Germans having invented some synthetic method of making jute?—I am not aware of that, no.

55,171. *The Chairman*: Is the use of fabric made from jute extending into fields that, up till recently, had not been exploited—for instance, in the backing of carpets and fabrics of that sort; is that something new?—No. that is old; when jute was first introduced into this country, it was used for binding threads for carpets in Abingdon; that is about a century ago; that is the first use to which jute was put in this country.

55,172. Then there was developed the bag?—Yes, sacks and bags and all kinds of containers.

55,173. But is there no prospect of finding new uses for jute?—Very little; the most recent I think, is wallpapers, where jute has been employed for putting on walls; they are doing that in America very largely and then painting it over. It makes quite a nice wall paper.

(The witnesses withdrew.)

The Commission then adjourned till 10.30 *a.m. on Thursday, the* 23*rd June*, 1927.

Thursday, June 23rd, 1927.

LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.

Sir THOMAS MIDDLETON, K.B.E., C.B.

Rai Bahadar Sir GANGA RAM, Kt., C.I.E., M.V.O.

Sir JAMES MACKENNA, Kt.. C.I.E., I.C.S.

Mr. H. CALVERT, C.I.E., I.C.S.

Professor N. GANGULEE.

Dr. L. K. HYDER.

Mr. B. S. KAMAT.

Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Colonel GEO. A. MALCOLM, D.S.O., and Mr. E. HENRY (representing the London Jute Association).

Oral Evidence.

55,174. *The Chairman*: Colonel Malcolm, you are Chairman, and Mr. Duffus is Vice-Chairman, of the London Jute Association?—(*Colonel Malcolm*): Yes. Unfortunately Mr. Duffus was unable to be present to-day. He was called away.

55,175. Mr. Henry, you are the Secretary?—(*Mr. Henry*): Yes.

55,176. You have not supplied us with a note of the evidence you wish to give us, but I understand you are willing to give us your views on the marketing of jute in London and also on certain experiments in jute-seed raising carried out by the Department of Agriculture in Bengal?—(*Colonel Malcolm*): Yes.

55,177. First of all, would you tell the Commission the constitution of your Association?—I have a short statement here. It will not take me very long, if I may read it to you.

55,178. That will be very convenient?—The various duties that the London Jute Association try to carry out are to support, protect and enhance the jute trade (these are part of the Memorandum of Association), to encourage and secure by all lawful means united feeling and action among importers, exporters, spinners, manufacturers, merchants, brokers and dealers engaged in the jute trade in London and elsewhere; to watch over all questions affecting the jute trade; to encourage the settlement by arbitration of disputes arising out of transactions in the jute trade and the appointing of arbitrators, umpires and experts for this purpose, and to hear and decide appeals from such arbitrators and umpires and to make awards and give decisions; to promote and maintain uniformity in rules, regulations and usages of the jute trade. This Association is in direct touch with the Calcutta Baled Jute Shippers' Association and the Calcutta Baled Jute Association. The latter consists, chiefly, of Indian balers and shippers. Many members of the London Jute Association have been brought up in the jute trade, their fathers before them having been pioneers of the trade

in its infancy. I mention these facts to show the deep interest the London Jute Association has in the welfare of the trade in general. Owing to various circumstances, the jute trade passed through two very critical years in 1925 and 1926. Prices rose to extreme heights, and first marks touched the excessive value of £55 in 1925 and £65 in 1926, and, as usually happens in strong markets with active demand, jute was deliberately watered. The result was a grave danger, not only to the jute trade in general, but more especially to the ryot in Bengal. Very successful attempts were made to grow substitutes in other parts of the world, and a most excellent substitute was produced in Madagascar. The lower grades of American cotton also replaced jute to a very large extent in the United States of America, and considerable quantities of spinning hemps and flax tow grown throughout Europe and elsewhere were very largely substituted. That I can say of my own knowledge, because my firm deal in pretty nearly every fibre that is produced and we dealt with very large quantities of jute with the Continent of Europe to replace jute grown in Bengal. Over and above this, spinning machinery was closed down throughout Europe and America, with the result that at one period the spinning capacity of raw jute was reduced by fully fifty per cent. In 1926 Mr. Finlow, the Director of Agriculture, Bengal, was in London. I saw him personally, and he attended a meeting of this Association, together with the Trade Commissioner for India, Mr. Lindsay. The result of this conference was a donation on the part of the London Jute Association to the Department of Agriculture, Bengal, of £1,500 for the improvement of jute seed. We received, this spring, a letter from Mr. Finlow giving the results and how he managed these experiments. If I may, I will just read you a short extract from his letter. It is dated Dacca, the 30th March, this year: "The distribution has been in progress during the last two months and the operations have now been completed. I described the scheme when I interviewed the members of your Association in London; but it may be of interest to repeat that the essence of the scheme is to make the cultivator do the last multiplication of seed himself. This is necessary because it would be impossible by any other means and within a reasonable time to produce sufficient seed to materially affect the capacity of the country to increase its production of jute. The system is not new to us, and in former trials it has been successful in introducing the use of departmentally-improved jute over considerable tracts of country. It was on this account that I had no hesitation in recommending the scheme to your Association. In the present case, 500 *maunds* of departmental jute seed, after testing, was packed into 160,000 quarter-pound bags which were then distributed in portions of the following districts:—Rangpur, Malda, Bogra, Mymensingh, Tippera and Noakhali. Magistrates and Collectors of the various districts, with their sub-divisional Officers and other members of the revenue staff, have taken personal interest in the distribution and have greatly helped agricultural officers in its successful prosecution. The same applies to presidents of Panchayats, District Boards, and to many officers of the Co-operative Department. Before the distribution, agricultural officers toured in each tract with magic lanterns and gave lectures which were largely attended, and listened to with great interest, on the object of the distribution. Many thousands of leaflets in the vernacular were also distributed at the lectures and elsewhere. In the distribution itself, as far as possible, the name and address of every man receiving a packet of seed has been taken. I should add that the contents of each of the 160,000 packets of seed, if multiplied as intended, will result in one acre of departmental jute in the season 1928. In other words, 160,000 acres of ordinary jute will be replaced by departmental jute in 1928. As each acre of departmental jute is capable, on an average, of yielding three *maunds* (240 lbs.) more fibre than a similar area of ordinary jute, the increased capacity of the area

affected by the distribution would amount to 480,000 *maunds* or 17,000 tons." In reference to that, I think that it is only right to say that our Vice-Chairman, Mr. Duffus, who is unable to be here to-day, asked me to state the following: "In support of the suggestion that the Government of India should allocate to the Agricultural Department, Bengal, for purposes of experiment, a certain proportion of the funds levied by taxes on jute, it is advisable to point out that it is doubtful if seed as presently raised by the Agricultural Department is producing a fibre suitable for the requirements of spinners and manufacturers, as from deliveries made in Dundee during the past season the finer qualities of jute have contained an admixture of a harsh fibre not containing the essential oil properties of the fibre received some years ago. The fibre referred to resembles *Meshta*, and is brittle, and this fibre is believed to be the product of seed supplied to the ryots by the Agricultural Department. Further, it is reported that after two crops Government seed shows an inclination to revert to type." That is largely a question of opinion. I know that Mr. Duffus has that opinion, and I believe that Messrs. George Henderson & Company have, too. On the other hand, it has to be remembered that many consumers prefer the harsher type of jute, and that is almost entirely so in the United States of America. I mention this to show how essential it is that funds should be provided to further experiment with this seed question. However, what my Committee desire me to urge is the absolute necessity of propaganda among the ryots of Bengal with regard to the proper handling of the crop, and to point out that the quality of jute produced in Bengal has been steadily deteriorating for some years past largely owing to bad handling and want of proper cleaning. I gather that the Bengal Chamber of Commerce informed the Royal Commission that there is practically no agricultural education in Bengal, and that they were not sufficiently in touch to feel assured that instruction could be adopted with advantage. I also gather that the Chamber did not feel qualified to offer an opinion as to how the scheme in rural areas should be administered. With all due deference, I would submit that the machinery is there as well as the money. Close on three million pounds sterling is obtained annually from export duties on raw jute and manufactures, and if only a small proportion of this sum, say £100,000, was allocated annually to the Department of Agriculture, Bengal, for propaganda purposes, an enormous amount of good would accrue, not only to the ryot of Bengal, but to the benefit of the jute trade in general. As regards the machinery, it has been proved by Mr. Finlow's report to us that the task could be undertaken by him through Magistrates and Collectors with their subdivisional Officers, throughout Bengal. I think that that is roughly all that I have to say.

55,179. There are one or two questions that I should like to ask you. In the first place, I should like to ask you whether you have yourselves, as an Association, or whether you, as an individual, have thought out at all any organisation which would have the effect of bringing all those interested in the jute trade together for the purpose of consultation and for the purpose of bringing to the notice of the Agricultural Department, and so of the growers, in Bengal, the requirements of the trade; whether anything, for instance, in the nature of the Indian Central Cotton Committee could be arranged. You know the organisation which is at work in India to-day in regard to cotton?—Yes. No, we have never been in touch in any way with them. Of course, in a way we are in touch with various bodies, such as the Jute Association of Dundee and with the Association in Hamburg, and we are also in touch with various associations in all countries in Europe concerned with the jute trade. Also, as I have already stated, we are in touch with the Baled Jute Shippers' Association and the Baled Jute Association, with whom we are in constant contact

with regard to the improvement in the trade, in the way of the marks they ship and the qualities.

55,180. You raise the specific point of quality of the jute grown from the seed distributed in Bengal by the Agricultural Department?—Yes.

55,181. That seems to be a point of very great importance and one as to which, at this stage, there ought to be no doubt. It ought to be known what the precise spinning and weaving qualities of jute grown from that seed are?—It is known to a very large extent. One sees that by the quality that comes to Europe, and it is well known to the Calcutta mills.

55,182. Is it the case that the fibre grown from that seed does not suit the British market?—I do not say that entirely. I do not entirely agree with that. There are certain consumers who require a very soft fibre. On the other hand, the United States of America and many consumers on the Continent of Europe prefer a harsher fibre. It is almost impossible to please everybody in that respect. They buy according to mark, the sort of mark they find produces the class of fibre they prefer. Is not that your view, Mr. Henry? (*Mr. Henry.*) Yes.

55,183. *Professor Gangulee*: Perhaps the purposes for which American mills utilise the jute are quite different?—(*Colonel Malcolm.*) No, it is all used for certain yarn purposes, and I think most yarn mills find the harsher fibre suits them better, whereas the Dundee spinners tell you that they prefer the softer fibre for, roughly, the same purpose.

55,184. *The Chairman*: You have to ensure that the buyers get what they require?—Yes.

55,185. Will you tell the Commission whether these various types of fibre are available to buyers on any particular mark or designation?—Yes, very largely. There are various types. They buy and they know these various types that suit their purposes. Personally, I do not think that this is a serious matter, this question of the harshness of the fibre. In any case, we have drawn Mr. Finlow's attention to it, and no doubt he will go on experimenting. The great advantage of the departmental seed which Mr. Finlow is so anxious to grow is that, without interfering with other crops, it will turn out a very much larger yield per acre.

55,186. That is a cultivator's point?—A cultivator's point, and a very strong point in their favour, naturally. I do not know whether the crop just now come to an end has been rather too much to handle, but the want of cleaning has been exceedingly bad in jute this year. It may also be partly put down to the climatic conditions early in the season, when the Brahmaputra went ten feet below normal at the very period when large quantities of water were required.

55,187. Is your London contract the same as the Dundee contract?—It is nearly on all fours. Dundee ask for Dundee arbitration, and, of course, naturally, our own is London.

55,188. Has there been, in your experience, any progressive deterioration in the quality of the jute during the last twenty years?—Personally, I think so, undoubtedly.

55,189. In what particular respect?—Possibly one is inclined to think that the jute produced twenty, twenty-five or thirty years ago was a very much finer fibre than to-day. It may be partly imagination, but I do not think so. I think that the actual fibre has deteriorated. Undoubtedly it has deteriorated from lack of proper washing and cleaning. But you must remember that thirty years ago the jute crop in India was a comparatively small affair compared with what it is to-day. To-day the consumption of jute when it stands at a reasonable price is enormous. The whole *raison d'etre* of jute is that it must be the cheapest fibre in the world, and when it gets to a low level of price compared with other fibres, as it is to-day, the increase in consumption is extraordinary.

55,190. Is it the cheapest fibre?—It is by far the cheapest fibre to-day.

55,191. How does still further cheapness open up new markets?—I have discovered, myself, that when jute gets to a low level or a reasonable level of price a very large demand springs up for it from the various rope makers throughout the world. Jute, when it is cheap, takes the place of very large quantities of spinning hemps, and it is made into twines.

55,192. Is hemp ever cheaper than jute?—When jute goes to a high price, very much cheaper.

55,193. So, to that extent, jute is not always the cheapest fibre?—No, far from it. In 1925-1926 it was one of the dearest. That is what nearly killed it.

55,194. Do you think that the impression that there has been progressive deterioration may be due in some measure to the fact that finer standards of spinning and weaving are in force to-day?—No, I do not think so at all. I am sure not.

55,195. Is that true, that finer spinning and weaving are in use to-day? —To a certain extent; but I think that they turned out equally good cloth twenty and twenty-five years ago. Is that your experience, Mr. Henry? (*Mr. Henry.*) I do not think that the fineness of spinning has increased. The machinery has been improved to produce a better article out of a lower class material.

55,196. My point was as to whether the impression that there had been deterioration was due rather to a more critical test in spinning and weaving than to any actual decline in quality of the fibre?—My experience in India is, practically, that as the crop has grown the quality has to a certain extent deteriorated. In former years, thirty or forty years ago, the ryot practically did all his own work. He sowed his jute, and did the weeding with the aid of his family. He retted it and prepared it. Now it has got too big for him, and he has to employ outside labour, and he draws largely on the fishermen on the rivers for his labourers during the jute season. At one time, I think somewhere about 1907 or 1908, there was an absolute scarcity of skilled labour on the boats because the men were getting a very much larger wage from the ryots to assist them in cutting and retting their jute. I think that it was 1907 or 1908. I think that the depreciation in quality is due really to the want of labour, or, rather, the want of skilled labour, and the want of proper attention. Then also, to some extent, as with everything else in the world, cheapness is really the ruling factor with everything more than quality now.

55,197. To what extent does quality affect the market? Is quality an important factor?—(*Colonel Malcolm.*) A very important factor. Naturally, some consumers buy their jute expecting it to turn out the quality for the purpose for which it is required. When the stuff comes forward they very often find that seventy per cent. or fifty per cent. is not suitable for the purpose required at all, and they have to enter the market and buy something better. That is usually the spot market which occasionally stands at a premium.

55,198. Does that suggest that the trade is incapable of improving in the matter of grading and packing?—I do not think so. Certainly, as far as the native baled jute is concerned, a great deal could be done, and it would improve their trade enormously if they could pack more regularly. That is why the big European shippers get a premium for their own packing. It can be relied on.

55,199. Do you feel that the channels of communication open to you, as representing the trade in London, for the purpose of bringing the requirements of your trade to the notice of persons interested in India, are sufficient?—I think so, in view of the fact that we are in touch with the Baled Jute Association and the Calcutta Jute Shippers' Association. They have their meetings. The Indian balers attend these meetings, and any

complaints we have to make, I presume, are put before them, and then they know perfectly well what the requirements are. They also know perfectly what the faults are.

55,200. Has it been your experience that when an important criticism has been brought to the notice of the authorities in Bengal by your Association, an improvement follows?—Occasionally, but not always. Of course, we legislate for the quality, and I suppose that the great bulk of the jute is shipped under our contract. It is a question of tightening up the guarantee clauses. In that way we are able to legislate very considerably.

55,201. Has the percentage of arbitration under the contract to lots bought increased of recent years?—Yes, especially last year. This year has been rather better. (*Mr. Henry.*) There have been fewer arbitrations but more private allowances. When the spinner complains, the packer says, "I will make you a slight allowance," and instead of having an arbitration they settle privately. (*Colonel Malcolm.*) Still arbitrators are kept pretty busy in London during the height of the season, day after day.

55,202. *The Chairman*: The figures before us suggest that there has been a very substantial increase in that matter in Dundee; but perhaps they are more litigious up there than they are in London?—I do not wish to say anything against the Dundee Association: I know them well; but, though I am a Scotsman myself, I may say that perhaps Scotsmen are sometimes rather difficult.

55,203. Will you tell the Commission what the scope of your London business is? Have you spinning and weaving factories in London?—No. We are merchants, practically, and merchant bankers. Large quantities of jute come to Europe which have to be financed. It is not a trade where you can get cash against documents. In very many parts of Europe, more especially since the War, a considerable amount of assistance has to be given, and that is done generally through London.

55,204. Are there no users of jute in London?—No. It is entirely confined to Dundee. As I said, when jute comes to a reasonable price there is undoubtedly an increase in consumption throughout the United Kingdom on the part of rope makers who are not usually jute spinners.

55,205. Do most of the firms represented by your Association store in their own warehouses?—Yes, in the public warehouses in Dundee, Dunkirk, Antwerp, Rotterdam, Bremen, Hamburg, and in the South to a small extent, in some Spanish ports, in Marseilles, and to a certain extent in Genoa in Italy; but the largest port for the storage of jute is Hamburg. because Hamburg is looked upon as the speculative market. A very large proportion of the jute that comes to Hamburg is not required for the German market. The countries who buy jute are Germany, Czecho-Slovakia, Yugo-Slavia, Austria, Poland, Scandinavia, and Russia to a small extent.

55,206. Is the bulk of the trading in jute in British hands?—Practically, entirely.

55,207. *Sir Henry Lawrence*: You spoke of the very rapid expansion of consumption of the recent crop. Can you give us the figures of the recent crop?—You mean for export from India?

55,208. Yes?—There has already been exported from India, out of this present crop, over four million bales of jute.

55,209. Is that a big increase on former years?—I should say that it is almost as large, with the exception of perhaps about one year, or at the outside two years, as any since the foundation of the trade. You must remember that there is one point with regard to that: that owing to the inflated prices of 1925 and 1926 and the great shutting down of machinery generally throughout the world in consequence of jute being too dear fibre, stocks everywhere were practically down to the last bale of jute when this crop opened. Therefore, there was a considerable

amount of room for expansion or replacing stocks which every wise consumer has to keep beside him for assorting purposes. No mill can bring its stocks to below three months' supply. Many of them, of course, ought to have six. A large number of mills usually run on at least six months' surplus supply. In Europe it got down to a question of weeks, and in some cases almost days. The big increase in the consumption this year may partly be caused by the replenishment of those depleted stocks. Still, I maintain that when jute is at a reasonable price compared with other fibres, there is a very large increase in consumption always. I have said it over and over again.

55,210. Continually going on?—Continually going on.

55,211. But at present, mills everywhere are working short time, are they not?—In Calcutta, of course, they have been working short time for some years. In Dundee, I do not think short time is anything very serious at the present moment. If so, it is purely temporary. I should say now that Central Europe is working full time. Belgium is working full time. In fact, I think that a short time ago Belgium was even working double shifts. France, on the other hand, is very much down in her consumption for various reasons, such as Exchange, and I think that France at the present moment is not working more than possibly sixty per cent. Italy is down very much just now, but that is entirely an economic question, entirely owing to her Exchange. The big appreciation in the Italian lira is preventing the Italian consumer from exporting his manufactured goods to South America and elsewhere. That also is a temporary matter. That is not affected by the price of jute, whether it is high or not. It is affected by the economic situation in Italy at the present time.

55,212. Your view is that there is room for expansion of production in Bengal to an unlimited extent or to a very considerable extent?—No, I will not say an unlimited extent.

55,213. A considerable extent?—To a considerable extent, provided it remains and continues the cheapest fibre.

55,214. One view put before us was that only a certain amount of jute was required, and that the effort of the Agricultural Department at improvements in Bengal should be especially directed to growing that amount of jute on a smaller area. That is rather different from your view?—Yes. I do not entirely agree with that view. I consider that if jute is to remain at a reasonable level of price, you require fair size crops every year. Everybody realises that if jute went to too low a level is is only a question of time and the output would be reduced, and then you would see a high level of prices.

55,215. *Sir Thomas Middleton*: What proportion of the jute sold on the London market is taken by Dundee?—The great bulk of it is done through London.

55,216. I do not ask what proportion of the Dundee jute is bought in London, but what proportion of the London trade goes to Dundee?—I do not quite follow what you mean.

55,217. Suppose that you have four million bales of jute exported from India?—Dundee takes roughly a million bales.

55,218. How much is handled on the London market?—I should say 90 per cent. of the crop. (*Mr. Henry*): Ninety per cent of the exports. (*Colonel Malcolm*): I should say ninety per cent. of the exports.

55,219. You say that there were about four million bales exported. Dundee would want about a million?—Out of this crop Dundee have, roughly, taken a million.

55,220. Is that about the usual demand, or in some years is Dundee a larger buyer?—No, that is about the average. The last few years Dundee

have taken less than a million bales. They have averaged about 900,000. That is approximate. I have not the figures in front of me.

55,221. The Dundee view appears to be that the market for an increased crop is decidedly limited; but we have other parts of the world to think about, and your view is that, given a low price or as you said, a reasonable price, there might be a very big market?—I feel convinced of it. You have only to see that the machinery is gradually increasing. Before the War, everything pointed to the consumption increasing and increasing and increasing. About two years before the War I suppose we had about as big a crop as we had seen, yet in spite of that it was all absorbed, and prices at the end of the season were higher than at the opening. The War checked it. My own view is that provided the world gradually recovers from the ravages of the War you can do with a very much larger crop of jute, because the consumption is going on increasing.

55,222. What would you call a reasonable price?—It is difficult to say. I understand that as compared with pre-War it costs now, to produce jute or to deliver it for export, fully £10 per ton more. You have the export tax on jute and you have the rupee at 1*s.* 6*d.* against 1*s.* 4*d.* before. Those two points alone add very nearly £6 a ton to the cost of jute. Of course, freights are higher, and the cost of loading in India is higher. The railway rates and the steamer rates are up in India. Then I suppose that the ryot requires more to live on than he did before the War. So you can roughly calculate that it is costing you £10 a ton more. In pre-War days one looked upon £18 as being a reasonable price. We have seen it considerably lower. We have seen it £14 and £15. £18 to-day is the equivalent of £28. A few weeks ago jute was below £28 in the London market. So, below £30 for the first marks, I consider that jute is at a reasonable price, and the consumption at that figure, that is below £30, will increase.

55,223. This year's crop is about 11¼ millions?—I should think between 12 and 13 millions.

55,224. You anticipate that, at the price of £28 to £30 a ton, it is going to be absorbed?—It has actually been absorbed. The exports are as large as ever they have been, and yet, in spite of that, the supplies of jute in second hand and in warehouses throughout Europe are smaller than probably they have even been with the exception of the last two years. It is almost unobtainable. There is no doubt about that.

55,225. From your experience, could you give us any indication of what the effect on the consumption would be if the price went, say, to £35?—£35 is not what you would call a very excessive figure. It begins to be dear. I do not think that the price at £35 would hurt jute. It is when jute gets to £40, £45, £50, £55, £60 and £65 that the thing is so serious. £35 would not hurt the trade.

55,226. You might still take 11 or 12 million bales at £35?—You might see your consumption down a little, because people probably would not stock to the same extent at £35. You might start competing at £35 with some of the lower grades of spinning hemps, though at the moment spinning hemps are fairly high. Jute at £35 a ton is comparatively reasonable with kindred fibres standing at a comparatively high level to-day.

55,227. *The Chairman*: I did not understand an answer that you gave to Sir Thomas Middleton about the percentage of the crop exported being handled by firms in Great Britain. Did you say that ninety per cent. of the crop exported is handled by British firms?—I should say that ninety per cent. of the crop exported is handled by the firms in London, members of the London Jute Association, ninety per cent. of the exports, the raw material.

55,228. Does that mean ninety per cent. actually imported into Great Britain either for consumption or re-export or ninety per cent financed?—I think you could say both, financed and sold to the consumer. When you ship jute it is financed in this way, that bills are drawn by the shippers in India on the receivers here.

55,229. The jute does not necessarily come to London?—No, none of it comes to London, unfortunately. London in pre-War days was the distributing centre for jute throughout the world; but the jute that comes to London now is nil, practically, except arbitration bales. You now get direct shipments to the continental ports. Direct steamers go from Calcutta to Dunkirk, from Calcutta to Antwerp, from Calcutta to Bremen and from Calcutta to Hamburg.

55,230. Ninety per cent. of the export of raw jute from Bengal is financed by London?—I should say fully ninety per cent.

55,231. *Mr. Noyce*: We have had a report from the Oldham Master Cotton Spinners' Association about spinning tests with certain improved varieties of Indian cotton as compared with American. Can you tell us whether any similar tests have been carried out with the improved varieties of jute in Bengal as compared with the ordinary varieties. Have sample bales ever been sent to Dundee for test?—I think they have only been tested to find out the proportion of water that there is in the jute.

55,232. That is not the only test of an improved variety?—That is the only test that I know of.

55,233. Would it not be well to have some definite authoritative test of every aspect of the improved varieties of jute put out by the Agricultural Department?—I quite agree, to a certain extent; but you have to remember when you are talking about an article like cotton that cotton is a comparatively expensive material. The whole *raison d'être* of jute is its cheapness. It is a comparatively cheap article, and I do not know that it would pay to go into all these elaborate tests. If you had the tests I do not think that they would lead to any improvement. They have their methods in India, and I do not think that they are likely to change them. The only method of changing them is to put the matter into the hands of an expert like Mr. Finlow, the Director of Agriculture, and get him for propaganda purposes to point all these things out.

55,234. I cannot see the object of putting out an improved variety unless you have some definite report on its comparative advantages?—There is a very large consumption of the commoner grades. If you are only going to produce fine jute it will kill the crop. I always refer to first marks. That is the bulk of the crop. It is a comparatively moderate quality of jute. Though first marks may be standing at £30, you can get something like £40 to £45 for fine. But that is used in comparatively small quantities.

55,235. It comes to this: Is it worth while for the Agricultural Department, whose resources and funds are distinctly limited, to work on improved varieties rather than on propaganda for improved methods of dealing with the jute?—I think that the fibre is wetted to a large extent. We want a better method of harvesting the crop and cleaning it. That is the chief point.

55,236. You consider that really much more important?—Yes, much more than improving the quality. After all, out of your crop you get a certain proportion of the crop selected by all the big balers in India for their finer markets. That is put on one side. You want to get the fibre as it is to-day but better handled. I consider that that can best be done by propaganda work, like Mr. Finlow did in regard to the seed, which comes direct to the ryot. That is the best way of dealing with it. That is what we want, and that would do an enormous amount of good to the trade. (*Mr. Henry.*) I should like to say this: With regard to the

experiments in seed by the Agricultural Department in Bengal, what they ought to direct their attention to is the production of a seed that is more immune to the ravages of the climate than the present seed is. We have seen in India, in my time, the disappearance of indigo owing to the want of chemical analysis in order to keep the indigo up to its standard. We have seen the Bengal linseed trade go down owing to the ravages on the seed. We have seen the silk trade of Bengal absolutely disappear owing to the ravages of insects on the silkworms. In all those cases, the Government of India stepped in too late. The trade had gone by the time they came in to try to recover it. That is what they ought to do now with regard to the jute seed of Bengal. As far as shellac is concerned, they have done absolutely nothing. The merchants of Calcutta have had to establish a Research Department of their own in order to try to find out where and how the ravages of the insect can best be countered. In all these things, the Government practically from time immemorial have stepped in too late. Now is the time. Their experiments in seed have been carried on now with four different types grown, evolved, one from the other. For want of funds, the experimental work of the Agriculture Department in Bengal is absolutely starved. They have no money. You, as the Government of India, take out of the jute exports practically two millions sterling. We merchants in London have had to give a donation of £1,500 to have the experiments carried out. Is that the British way of doing it?

55,237. *Sir Thomas Middleton*: The point you were making is this, that Mr. Finlow's object is to grow a big crop, a certain crop?—(*Colonel Malcolm.*) I am talking of the scientific part of Mr. Finlow's experiments, the object of which is to produce a seed which is more immune to the ravages of the insects. It naturally follows if you can do that that you get a bigger crop.

55,238. *Mr. Noyce*: With reference to lac, I think that you are incorrect in stating that the Calcutta merchants started their own committee. The Lac Committee was the result of a Government enquiry, and it is financed by a Lac Cess imposed under Government auspices?—(*Mr. Henry.*) All through my time when I was in India they never did it, only the last three years.

55,239. They have now done it?—They have left it. It is a question, even to-day, whether the Government of India have not stepped in too late over the lac. The lac trade with America has decreased by fifty per cent. in the last two years owing to synthetic lac being produced in America, which would never have taken place if experimental steps had been taken

55,240. *Sir James MacKenna*: Is there any reason why the trade itself should not take some hand in doing what they desire? Shall I tell you what the cotton people are doing?—(*Colonel Malcolm.*) Please.

55,241. The cotton trade has organised itself, from the producer up to the manufacturer, by means of an Indian Central Cotton Committee on which every branch of the Industry is represented, from the grower to the mill. The Committee is financed by a cess of two annas on every bale of ginned cotton. With that fund they have set up a Central Research Institute in Bombay, where spinning and weaving tests are carried out, in addition to which they finance the experiments in the improvement of cotton all up and down the various Provinces by giving grants from the fund received from this cess. Do not you think that the jute crop lends itself as well as any other crop to the same kind of thing?—Yes; but there are so many interests involved in jute. Is that to come out of the funds of the Jute Association? We do not possess great funds. Are we to approach France, Germany, and in fact every country in Europe which uses jute, every country with the exception of Turkey? Also, as I said before, cotton is a very much more important and expensive article

than jute. I cannot see why a small allotment could not be made out of the export tax imposed by the Government of India. Surely, if it comes off jute, a small proportion of it might be earmarked for the benefit of jute. Where does it go to? Into the general taxes of India! I would suggest that if that cannot be done a further small tax should be imposed on jute in case of need to obtain these funds. Then everybody would pay his share. It would be in the price.

55,242. *The Chairman*: On jute exported?—Yes, and manufactured goods exported too. You have already got a tax on raw jute of four rupees eight annas a bale. If you put on four annas and made it four rupees twelve annas, instead of four rupees eight annas, and let those four annas be earmarked for the improvement of the jute, I think that would never be felt.

55,243. That is exactly the way in which cotton was dealt with?—Has cotton got a big export tax upon it which the Government seize?

55,244. *Sir James MacKenna*: No?—We have already got a tax. If the Government will not agree to give any of that to the improvement of jute generally in Bengal, then I say put on another four annas. I do not think that would be felt very much on the price.

55,245. That is a step forward?—(*Mr. Henry.*) You will also then levy a cess on jute consumed in Bengal. (*Colonel Malcolm.*) This tax is levied, I understand, on raw jute, plus so much on the manufactured goods turned out by the Calcutta mills. It would have to be on the same lines as the present tax on the raw jute and the manufactured jute.

55,246. *Dr. Hyder*: Is it known to you that, the moment we export jute to Australia or America, there are high duties?—What is going to compete with the Calcutta manufacturer?

55,247. These countries admit raw jute with no duty, but the moment we send manufactured jute to them they put on a heavy tax?—That must be a very small affair. There is no jute spinning in Australia worth speaking about. (*Mr. Henry.*) You cannot compete with the labour in Bengal.

55,248. *Sir James MacKenna*: All cotton consumed in India is also liable to pay the cess?—Yes; I do not see that there would be any difficulty at all.

55,249. Surely your Association would support such a cess?—(*Colonel Malcolm.*) I am sure it would, because they feel that it is eventually going to be for the benefit of the trade as a whole, and not only of the trade but of the ryot.

55,250. The fund would be entirely devoted to jute?—Yes, to that and nothing else.

55,251. *Professor Gangulee*: You have now suggested sources from which funds might be obtained for the improvement of jute?—Yes.

55,252. It is not quite clear in my mind what improvement you want. Do you want a larger yield or better quality?—What we want is better handling of the jute, better cleaning, better retting, more attention paid to it at the time of harvest, so that instead of getting great black runners you can get clean jute.

55,253. Your suggestions regarding jute research would then be directed mainly to questions of harvesting, retting, baling, packing and so on?—Not baling and packing to any great extent.

55,254. Grading?—Grading, yes.

55,255. You would not emphasise the botanical side of the work at all?—No.

55,256. You have no information whether these improved varieties of jute have any better strength in fibre than any other quality known in the trade?—You mean the finer grades?

55,257. Yes.—Undoubtedly it is very much stronger fibre and well handled. It is simply picked from the whole of the crop. Every man who buys large quantities of jute selects it, and in the course of, say, six months, he gets a certain quantity of really beautiful stuff which is baled separately.

55,258. Do you have special marks of identification of jute from the districts where it is grown?—We buy Dacca jute, *Tossa* jute, and so on.

55,259. They all come to Calcutta to the balers?—Yes.

55,260. They do not get mixed up?—Yes, occasionally they have got mixed up, and in such a disgraceful fashion and deliberately mixed (I will not use the word "swindled," but partly in that way) that we had to legislate for it in the contracts.

55,261. When you want to make a contract for Serajgunge jute you want pure Serajgunge jute; you do not want any mixture of Dacca?—Dacca would not be so bad, but they were mixing very large quantities of *Daisse* and *Tossa*. Very many consumers in Europe cannot use *Daisse* or *Tossa*.

55,262. These jute marks bearing names of well known districts get premiums on the market?—It varies very considerably. Dacca, certainly: You can always get a premium on Dacca, a very considerable premium.

55,263. You have not stated, in your remarks, anything about jute forecasts?—No, there has been a good deal of ill feeling in the past few years about the jute forecasts. It was largely caused, I consider, by the horrible figures given which proved to be so terribly wrong. That was largely caused, I am convinced, for three or four years after the War, by the large quantities of jute which, owing to the War, could not be exported and were held up country. The Government of India never took into account that such very large surpluses were left over through the War years from, say, half a dozen crops of jute. I consider that the guess is a very fair one, considering the difficulties they have. This year, they are under the mark again. They thought that the crop was going to be one of 10,000,000 bales. It is going to be over 12,000,000 bales. After all, one realises the difficulties in a country like Bengal, where jute is grown by so many people, and it is exceedingly difficult for the Government to estimate the crop. I do think that the Department of Agriculture in Bengal should, before they actually issue their figures (perhaps they do so) get figures from people who deal largely in the interior of India with their up-country buying agencies, such as Ralli Brothers, Hendersons and Sinclair Murray, who get their own information.

55,264. Do you get information from these private agencies?—Certainly.

55,265. Independently of the Government forecasts?—Yes, and very often it is better than the Government's. Gentlemen go up country and cast their eyes across the fields and they can guess as to whether it is a good crop or not.

55,266. With regard to the suggestion that improved varieties of jute grown in Bengal are immune from insect pests, is that established?—(*Mr. Henry.*) I do not think so. When Mr. Finlow was here he talked about a new seed that he was then hoping to get which would be immune from a certain insect. Whether he succeeded or not I do not know. He got one seed which produced a very fine jute, after the third experiment, clean, bright jute, but it lost its colour after about a month. After that he experimented again. I think that it was with a seed called "404" or something like that. He got the jute that he called *Kakja Bombai*, but that jute was a sort of hairy jute. It was not clean and smooth like the Dacca jute. The fibre was hairy.

55,267. Rather coarse?—No, it was not coarse. It gave the appearance of being hairy like a caterpillar, only not quite so bad. He was experimenting again after that. I rather think that something stopped it; whether it was want of funds or not I do not know, but he did not carry on for

another cultivation from that seed, which he was very anxious to do, as he thought he could get a seed that would grow all the qualities of Dacca jute, without the objections that were raised to *Kakja Bombai*.

55,268. *Mr. Kamat*: You told the Commission just now that you were in favour of an export cess of, say, four annas on jute. Are you keen on earmarking that cess for the improvement of jute only?—(*Colonel Malcolm.*) Absolutely; otherwise we would rather not see it. I do not urge the four annas. What I urge is that four annas should be taken out of the present export tax; but if that cannot possibly be done I say, in case of need, in my opinion, the jute trade could bear the tax of an extra four annas, but it must be devoted to jute only.

55,269. And not to problems like marketing and other kindred problems?—No, that is not wanted. That would come in.

55,270. The donation of £1,500, which your Association gave, was a private arrangement with Mr. Finlow?—What exactly happened was that we were all suffering from this acute crisis and we saw that there was a great danger to the trade. I heard that Mr. Finlow was in London. I got hold of him and asked him to come to lunch with me. I said: "The position is a very serious one. Is there anything we can do as an Association to help you, because we see the red light?" He said: "What I should like would be if we could get £1,500 a year for five years. Then I think that I could do a great deal of good." I said: "I could not promise you £1,500 a year for five years, but the position is so critical that I personally will guarantee you £1,500 out of my own pocket in case my Association do not agree to it, but I should like you to meet my Association. I will put the matter before them and see what they say." He and Mr. Lindsay came and met my Committee. My Committee agreed to give £1,500 for this one year, but there it ceases. We tried to get the Dundee Association to join us and we tried to get the Calcutta Mills Association to join us and guarantee that £1,500 for five years. But Dundee would not agree to do so, because they thought that it was a Calcutta matter, and the Calcutta Mills Association did not agree to do so. We said: "We think that it is hardly right. Why should we pay the whole thing out of our own private pockets?"

55,271. *Professor Gangulee*: Did you get any report from Mr. Finlow?—Yes, that report I read just now. He begged for another £1,500 a year for another four years.

55,272. *Mr. Kamat*: As regards your suggestion in respect to packing and baling, are there two separate associations in Calcutta?—Yes, there is the Calcutta Baled Jute Shippers Association, which consists chiefly of European houses, and there is the Calcutta Baled Jute Association, which consists chiefly of the Indian balers.

55,273. Have you found any distinct difference in the quality of the bales of the European balers as opposed to those of the Indian Association?—Yes, a very great distinction, but you have to pay two or three pounds a ton more for it: It is very much better jute altogether, selected, indeed.

55,274. Do you say that what you receive from the European Balers' Association is faultless?—There are very seldom complaints. Occasionally there are arbitrations held, but that is very seldom, nothing like to the same extent.

55,275. Most of the arbitrations are in connection with the bales received from the Indian baler?—Almost entirely, but there are certain balers in Calcutta who do their best to bale up to standard and succeed very fairly well, and very seldom are arbitrations held on their jute. The result is that they usually get a premium for their own marks.

55,276. Have you reason to believe that, in this matter, the fault chiefly lies not with the grower but with the baler?—Usually with the baler.

55,277. The remedy, therefore, is to educate him to send proper bales?—To a large extent, but if he cannot get a suitable quality from the grower, owing to bad cleaning and bad handling, what is the poor man to do? It is not entirely his fault.

55,278. You have just told us that the European bales are perfect, and that the others are not?—They are better. They are properly handled and cut, whereas in most cases of Indian-packed jute they do not pay the same attention to the handling and the cutting.

55,279. So far as the harvesting methods are concerned, they are common to both?—They are, but of course it usually means that you have to buy a higher grade of jute altogether and select it. All these big European shippers select so carefully that they can grade their jute down, and after baling for a couple of months they get a certain quantity of the superior jute in hand, which they sell at a high price. It is largely a question of selection.

55,280. You have no reason to believe that the faulty baling is deliberately done?—I am afraid in some cases (I do not wish to make any assertions) undoubtedly. If you ask me honestly, yes. I will tell you why. It is so irregularly packed that they gamble on the bales going to be selected. When you select bales for arbitration, ten per cent. is left at the port of discharge and out of that ten per cent. you select, say, fifteen bales or sixteen bales for arbitration purposes. They must be unopened and absolutely sound bales, and they are selected at random. Then they come to this side and they are arbitrated on. You open these bales, and the result of it is that you may get an allowance of sometimes £1, £2 or even £3 a ton on quality. There may be another parcel of the same mark in the same steamer and the same bill of lading date but going to another consumer, and arbitration is claimed on that parcel. It comes to London and is arbitrated on in the same way, but perhaps the consumer in that case has been unfortunate and rather better bales have been sent for arbitration, and, instead of an allowance of £3 a ton, it may be an allowance of 15s.

55,281. Would you be in favour of legislation to stop this sort of game?—How can you do it?—(*Mr. Henry.*) I do not think that by legislation you will ever teach the Marwari anything that he does not know.

55,282. *Sir Thomas Middleton*: In reply to Professor Gangulee, you expressed the view that botanical research might not be required?—(*Colonel Malcolm*) I think that you want botanical research, undoubtedly, as it is being carried out by Mr. Finlow; but we want propaganda with regard to how to harvest the crop properly.

55,283. What you want is a large crop and a certain crop per acre, and in order to secure a full crop per acre you want to pay attention to the variety?—Undoubtedly, but whether you are going to get a large crop and a full crop per acre depends entirely on the Almighty and the weather conditions. The other matter is one where the human element comes in, and with proper propaganda and teaching you can improve the harvesting of the crop, whatever the weather conditions may have been.

55,284. *Professor Gangulee*: Can you say that the yield from superior seed would be about the same as the yield from ordinary seed sown by cultivators?—No, the yield from the Government seed per acre is undoubtedly larger; not only that, but Mr. Finlow maintains that it stands the weather conditions better. When you get adverse weather conditions, the ordinary seed put in by the native is apt to droop and wither, whereas his seed, he maintains, stands the weather conditions better.

55,285. Is it more immune from plant pests than ordinary races?—That I cannot tell you.

55,286. *Mr. Noyce*: Why did not the Calcutta Association join you in your guarantee? Did not they see the red light?—I think that the reason

they refused to join us was that they had already given some sort of guarantee to the Government with regard to seed. It was a very much larger grant than £1,500, though, in my opinion, the guarantors did not stand much risk of losing their guarantee.

55,287. *Sir Henry Lawrence*: Can you tell us why the Calcutta mills are working only half time and the mills in Europe are working full time?—European countries, for one thing, or nearly all of them, with the exception of this unfortunate country, have "Protection," and Calcutta cannot compete, for instance, in the French market or the German market, because they have protective tariffs. If there had been no protective tariffs in Europe, Dundee would stretch for fifty miles of jute mills or more. When Germany first started jute spinning, in the early seventies, they could not compete with Dundee, even though Dundee had to spin their jute in Dundee and send it across the water to the interior of Germany. The mills in the interior of Germany could not compete. The result was that someone went to Bismarck and said: "Our trade is ruined unless you put a tariff on to protect us from Dundee. If you give us a tariff the jute industry in Germany will increase." Bismarck saw the point and promptly put a tariff on, with the result that mills have been springing up all over Germany. Calcutta cannot compete, because of the import tariff. The same applies to France. Calcutta goods cannot come into France until the French mills have sold their production.

55,288. You do not suggest that there is any bad management in the Calcutta mills?—I do not suggest that for a moment. I do not think that the management can be bad, considering the dividends they pay. I am not a shareholder.

55,289. *The Chairman*: Do you think that the practice of holding heavy stocks is likely to recur?—I do not think so, because not only in jute, but in all trades, everybody realises that the position is very different since the War. The difficulty of carrying large stocks is largely because of the enormous fluctuations in most articles of produce. The risk is too great. You put jute into a warehouse at any port in Europe to-day. You have to land it. You promptly get 10s. a ton added to your price by putting it into a warehouse. Unless you can get a rise in the market, how are you going to get your 10s. a ton back?

55,290. *Sir Henry Lawrence*: How long does jute keep stored?—It is a wonderful article in that respect. It will keep for years and years. I remember that many years ago there was a rummage sale at the docks in London, and at the back of a warehouse on the south side of Victoria Dock (it was in the days of the old sailing ships) they discovered some jute wrapped in hessian cloth. My father went down to see it. It had been there for about a quarter of a century. He said that it was absolutely perfect, as good as if it had come there the previous week. Jute does not deteriorate to any extent.

55,291. *The Chairman*: Can you distinguish the current year's crop from previous years' crops by appearance?—In this respect you can, that the colour always goes. In the case of jute packed in the month of August and the first half of September, owing to the ample supply of steeping water, the colour is almost invariably good. When you come to the months of October and November, because the water gets dirty or because of want of steeping water, the colour begins to go at once.

55,292. *Sir Henry Lawrence*: Does the colour command a higher price?—Very much in some quarters. A parcel of good coloured jute, if it was brought to this country and stored for six or eight months, entirely owing to its excellent colour, would fetch a premium of 30s. to £2, as against jute shipped late in the season, say, between December and March.

55,293. To that extent, jute stored for years will deteriorate?—It all depends on how it is packed. I am simply referring to jute packed in August or September as against December-February.

55,294. *The Chairman*: To the extent that the practice of holding stocks is being resumed, is that likely to tend towards stabilising prices?—Undoubtedly it will tend that way.

(The witnesses withdrew.)

Mr. JAMES LITTLEWOOD, representing The Oldham Master Cotton Spinners' Association.

NOTE OF EVIDENCE.

This Association proposes to give evidence only on the subject of cotton grown in India which is exported for the use of spinners in England.

If this trade is to be expanded, attention in India should be concentrated on the cultivation of such varieties of cotton as can be substituted in English Mills for American cotton.

The style of cotton required is white or creamy in colour, good grade (*i.e.*, free from leaf, seed, neps and stains), staple $\frac{15}{16}$-inch to $1\frac{1}{8}$-inch with diameter of fibre similar to American, and packed to a density not higher than a standard 400 lb. bale.

A point to remember is that few mills use Indian alone. but mix with American.

Some of the troubles experienced by English spinners who use Indian grown cotton are as follows:—

Mixed seed.—This results in irregularity in the characteristics of the bulk cotton, harsh and strong, soft and weak fibres, mixed together and variegated color.

Deterioration of seed.—Well-known standard types of seed which formerly produced say good 1-inch staple have gradually deteriorated in the last few years till only bare $\frac{7}{8}$-inch is now the result. As an instance, Broach cotton has for several years been growing shorter and coarser than formerly and not as easy to spin. It is suggested that this may be the result of excessive crops being grown from the seed of previous crops on the same ground, and that more frequent renewal of seed from Government farms might restore and maintain the old quality.

Mixed staple.—Too much attention cannot be paid to the desirability of keeping the longer staples from the shorter. Cotton which shows a fairly even 1-inch staple is of greater value to the spinner than cotton which varies from $\frac{7}{8}$ to $1\frac{1}{8}$-inch. The mixing in of short stapled cotton causes excessive waste to the spinner and he at once condemns the cotton. If staples of different lengths could be kept separate, it would tend to improve the value of each staple and ultimately the farmer would reap a greater reward where his care succeeded in producing a better staple.

Crushed seed.—This is a serious cause of trouble because of the stains produced by the natural seed oil.

Ginning.—Increased care is necessary in this process. Inefficiency is responsible for quantities of crushed seed, excessive broken leaf and seed, besides quantities of whole seeds left in the cotton. The roller gin is predominantly in use in India, but we find that there are some types of cotton which are much improved by being saw ginned.

Density.—The standard Indian cotton bale is one of 400 lbs. condensed to about 10 cubic feet. This is much higher than the density of the American bale which as a rule does not exceed 30 lbs. per cubic foot.

The English spinner who normally uses American cotton finds difficulty in opening the harder pressed Indian bales without specially adapted machinery, particularly if he receives the 500 lb. bale. This difficulty is much increased for the normal user of Indian cotton and is almost a certain deterrent to a new user if there is an excessive amount of damping of cotton before compressing, as this produces caking. We think that the 400 lb. bale should be the maximum.

Marketing.—Spinners in England using various kinds of cotton require a continuous supply of each kind during the whole year, so as to maintain regularity in their yarn. The seasons for the principal kinds of Indian cotton are short. If a spinner desires a continuous supply of say Punjab American he must buy during the season his estimated requirements for the year. This needs extended financial resources. This difficulty would be overcome if some sort of Standard Deferred Delivery Contract could be established. For this purpose it would be necessary to establish grades of cotton somewhat similar to the Universal Standards for American cotton. A great drawback has been that spinners have not been able to rely upon getting consistant shipments as regards quality even during the same season. Formerly there used to be a spot market in England for Indian grown cotton, but buying now has almost all to be done on the basis of standard type numbers. The establishment of reliable standard types with confidence that shipments could be depended upon would be an important factor in attracting more spinners of American cotton who are accustomed to seeing the cotton offered for sale before purchase or in being able to rely with safety upon placing a deferred delivery contract in American Cotton that they would get what they had bought.

Marketing of bales with the name of the ginnery has only recently been put into operation. We trust the system will be quickly extended to all Indian grown cotton. Faults and complaints can then be more easily and quickly traced and remedied.

Complaints.—We suggest that it would be an advantage if a sort of clearing house for complaints were established in this country to which complaints of a general nature could be addressed by spinners and disseminated to the appropriate quarters for noting and correction.

Spinning tests.—Actual spinning tests were carried out in 1925 and 1926 by members of the Oldham Master Cotton Spinners' Association on samples of various growths of cotton submitted by the Indian Central Cotton Committee. The comments of the spinners may be useful to show what is desirable and what is undesirable. Reports were published in the Empire Cotton Growing Review, April, 1925, and October, 1926.

Spare copies of the 1926 tests are submitted herewith.*

Oral Evidence.

55,295. *The Chairman*: Mr. Littlewood, you are of the Royton Spinning Company, Limited, and you are before the Commission on behalf of the Oldham Master Cotton Spinners' Association?—Yes.

55,296. How far does Lancashire distinguish the improved varieties of cotton, that is to say, varieties improved by the efforts of the agricultural departments in India?—It is very difficult to say, for this reason, that we find the greatest difficulty in being able to trace how to get hold of them.

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* Not printed.

I personally have written to Mr. Burt and one or two other people to ask where we could find these improved varieties, but we have not been successful in finding them, and in knowing them when we have found them.

55,297. It would be very satisfactory to all concerned if you could distinguish improved varieties for what they are and could get them on the Liverpool market?—It would. There is one lot, in particular, in the list that we sent you, about which I wrote to Mr. Burt. I suggested that he should appoint some recognised broker or merchant as an agent for this particular lot, so that we should know where we could find it; but he did not agree.

55,298. *Mr. Noyce*: Which one was that?—That was 1027 Surat; I think that is the best I have seen, the most improved type I have seen.

55,299. *The Chairman*: Is it the case that during the past year there has been a very narrow margin in price between Middling American and F.G.F. Tinnevelly; and if that is so, has it reacted unfavourably on the market for Indian raw cotton in this country?—Very considerably; the price of Fully Good Fair Tinnevelly has been at times higher than the price of Middling American; it is only at a discount that it interests the spinners here, because there always a greater loss in using the Indian as we get it, than there is in using the American.

55,300. So that the narrowness of that margin does react unfavourably on the market for Indian raw cotton, just as it reacts unfavourably on the market for the product, the cloth of the Bombay mills?—Undoubtedly.

55,301. Is your Association satisfied with the spinning tests carried out by the technical laboratory of the Indian Central Cotton Committee?—The Association as an association has not had an opportunity of studying them. I personally only saw the booklet, I think one day in this week, but they largely confirm the tests that we, as an association, have made. I am referring now to the tests made for the Indian Central Cotton Committee.

55,302. There again it might be satisfactory if more information were available to your members?—Undoubtedly there are many things that particularly require to be done with the Indian cotton before it can really spread among the users in Lancashire. There are one or two things we have mentioned, in the outline of evidence given here, as reasons why the ordinary Lancashire spinner cannot handle it; it really requires very heavy machinery. There is the high density, which is a very serious matter, particularly with the heavy pressed bale, the 500 lb. bale; it really requires very heavy machinery indeed to open the cotton sufficiently well to spin. It will spin, but it spoils the American. We have to bear in mind, as is mentioned in the outline of evidence, that there are very few spinners in Lancashire using Indian cotton alone; it is used along with the American, mixed in at the hopper, and of course the hopper takes the lighter density cotton first, and leaves the heavier density cotton behind; the result is that you do not get a perfect mixing. Also, in the 500 lb. bale, we notice a lot of obvious damping of the cotton, with the result that the cotton is clagging right through to the spinning machine, and you do not get a perfect yarn; you get it coming through with thick pieces in the yarn breaking and making a thick piece in the cloth. That is why we recommend the 400 lb. bale of cotton. Personally I use a lot of Indian cotton, and I find the 400 lb. bale is better; the density approximates more to the American bale and we can mix it better.

55,303. Would you go so far as to say that the damping which is going on to-day, in India, is seriously prejudicing the reputation of Indian cotton in the Liverpool market?—I should not put it in that way; I should say it is seriously prejudicing the spread of the use of Indian cotton. The average Lancashire spinner has not sufficient opening machinery to tackle it. Two years ago, when Indian cotton was cheap and some of the spinners were trying to use it, they were debarred from using it because they could not open it.

55,304. On page 365 of your note, under the head "Marketing," you suggest the institution or some sort of standard deferred delivery contract. Has there been any active movement towards anything of that sort?—Nothing that I know of.

55,305. Is such a contract recommended by the Association?—Yes it has been, where they have considered it.

55,306. But the other interests concerned have not been approached by the Association?—They have not been approached.

55,307. Is your Association in touch with the Indian Trade Commissioner's Office?—No, he has not been approached by us in any way.

55,308. You have not used the machinery of that Office as a clearing house for complaints?—No.

55,309. Would you consider whether that would be convenient to you as an Association? I think you are anxious to have some channel through which your complaints on technical points can be conveyed to the proper persons in India?—We should be very pleased; I did not know the Indian Trade Commissioner, but I was thinking more of the Empire Cotton Growing Corporation. I think the channel you have mentioned would be far better.

55,310. In the matter of marketing of bales, you are satisfied with the result of the practice recently put into force, and you are anxious that that should be extended?—The marketing, yes.

55,311. Have you been able to use the opportunity of identification afforded by these marks in any particular instances?—I personally have; I do not know about other spinners; I have used it this season.

55,312. With good results and good effect?—I do not know what the result will be; the result that I am seeking is to prevent the faults arising on future occasions that have arisen this time. I have put the complaints through and I have had the necessary allowances for the faults, but we do not seek allowances, we want the goods; we cannot spin allowances.

55,313. You have been good enough to send us a copy of the spinning tests for Indian cotton; those are the tests fixed by the Oldham Master Spinners' Association?—Yes.

55,314. How long have those tests been in existence?—We made two principal lots of tests in 1926 and 1925, and one or two of the 1926 tests have been repeated.

55,315. Can you tell the Commission whether those tests were fixed upon in consultation with the Indian Central Cotton Committee?—No, they were selected by the Indian Central Cotton Committee, and the bales sent on to us.

55,316. The tests?—No, the particular lots which had to be tested were selected by the Indian Central Cotton Committee and sent on to us for testing; we had nothing to do with the choice of them.

55,317. *Professor Gangulee*: On the question of the marketing of cotton, could you tell the Commission what significant changes have been effected since the inauguration of the Indian Central Cotton Committee? You have mentioned that the marking of bales has been improved and that has been very helpful to the trade; besides that, what other changes do you think have been the result of the work of the Indian Central Cotton Committee?—I do not know of any, because, as I said earlier, we are not in a position, and have not been in a position, to tell which of the lots have come from the control of the Indian Central Cotton Committee; I have applied through the leading shippers, Messrs. Volkart Brothers, Ralli Brothers, and so on, but have not up to now been successful in ascertaining what we can know as Government-grown cotton, because each big shipper insists on selling his cotton under some known type or type number, and with that we have to be satisfied.

55,318. On what evidence do you suggest that deterioration of seed has been noticeable?—Personally, I have suffered. We have to speak, largely, personally. There are not many large users of Indian cotton even in the Association. I personally have noticed a very marked change in the Punjab-American cotton during the last three years, particularly this year; this year has been a very bad one: one of the worst I have ever known both in regard to dirt and in regard to mixed staple; when the staple has arrived it has been of a different character from what we have had previously, and the spinning results have been really bad.

55,319. *Dr. Hyder*: What variety is this?—4 F., largely.

55,320. *Professor Gangulee*: With regard to the mixed staples of which you speak on page 364 of your written evidence, has that been improved since the Indian Central Cotton Committee undertook the problem of cotton cultivation in India?—It may have been improved in certain lines, but the lines that I largely use are not under the control of the Indian Central Cotton Committee; they are controlled by the large shippers who have their own buying agencies and their own ginneries, and they are not under any control, as far as I know.

55,321. Is your Association well aware of the activities of the Indian Central Cotton Committee?—Very closely in touch.

55,322. *Mr. Calvert*: Is there any touch with the British Cotton Growing Association?—Yes, because the contact with the Indian Central Cotton Committee has really come through the British Cotton Growing Association and the Empire Corporation.

55,323. The British Cotton Growing Association is largely a Lancashire Association, is it not?—Yes, it originated in Oldham.

55,324. You mentioned the difficulty of getting real samples of the new types of cotton; the British Cotton Growing Association has a large farm in the Punjab for these cottons?—I did not mention the difficulty in getting the samples; we have no difficulty in getting the samples; it is in getting the bulk we have difficulty. We have had any amount of samples; we have had a bale for the Liverpool Association, the Manchester Association and so on; but we do not get any further than that; when we ask: "Can we buy this particular type?" nobody has it.

55,325. *Mr. Kamat*: On page 365 of your memorandum, you suggest, in order to establish grades of cotton, some similar arrangements like the universal standards for American cotton; will you please amplify that a little?—May I ask first if you have any knowledge of the system of the American cotton, the universal standards?

55,326. That is exactly what I want to know; what is the suggestion contained in your memorandum about the universal standards that they have established?—There are certain specified grades for the American cotton, commencing at about "mid-fair," coming down to "fully good middling," "strict middling," "middling," "low middling," and so on. This is how we buy our cotton in Liverpool: when I go to a merchant in Liverpool and say I want to buy 100 bales of "strict middling," I know I shall get strict middling from him; he will sell it against his type and deliver to me what I have bought. His method of buying is very different from the buying of Indian cotton. He may buy a thousand bales of, say, "strict middling," and then he makes his selection from that; he may have fifty per cent. of "strict middling" in his thousand bales; he may have twenty-five per cent. of "fully good middling" and "twenty-five per cent. of something below; so that he gets a premium on anything that is above his purchase, and of course he gets his discount on the other; but on the average he gets a "strict middling" purchase, and he delivers to me out of that purchase what I have bought: "strict middling" cotton with very little variation.

Mr. James Littlewood.

55,327. In India we have not got a system exactly like that, but certain grades have obtained a reputation, for instance, Dharwar, Broach and Cambodia. If your suggestion were accepted, would it upset our present grades which have obtained a definite reputation in the market?—Not necessarily so, because you could establish those grades as definite grades. But our quarrel is not with your grading; our quarrel is with the fact that when we have purchased, we will say good fair Tinnevelly, a certain known type (I have a certain type in mind, but I will not name it), when it arrives it is vastly different, and we are put to the trouble of arbitration and claiming, and, as I said a little while ago, it is no good to us: we cannot spin allowances, and the yarn suffers in consequence.

55,328. It becomes, then, a question of improving the ethics of the trade?—Exactly; what we, as spinners, ask is that when we buy something we shall know when it arrives it is there or thereabouts.

55,329. Not a question of re-marking existing types such as "fully good" Broach?—No.

55,330. *Sir Ganga Ram*: Does high density injure the fibre?—No, it does not injure the fibre, but the spinner, as a general rule, has not sufficiently heavy opening machinery to open it to mix along with his American.

55,331. What is the density of the American bales?—About thirty lbs. against forty or fifty lbs. of the Indian cotton.

55,332. Have they similar presses or different kinds of presses?—I have not been to America, but they may have a different press or they press to a different density; what their press is, I do not know.

I may tell you they have different kinds of presses in which the air is expelled more than in the Nasmyth Wilson press in India; it is the air which causes the pressure on the Indian cotton, rather than the material itself; the more air you exclude, the less pressure there will be. I have seen that machinery; it was exhibited in the Paris Exhibition.

55,333. Last year, a lot of American and *deshi* was mixed; did you buy any of those bales? In the Punjab the Indian cotton, the *deshi*, and American were mixed together; really the Japanese started that idea. Did you buy those bales as well?—Not intentionally.

55,334. I know that a large quantity was exported to England?—It may do for certain trade, but not for a really good yarn.

55,335. Indian mills also mix American cotton?—Yes; there is no difficulty in mixing the American cotton and the Indian cotton, provided you have sufficient opening machinery or if the bale is not too hard pressed to be opened by the machinery that you have. The difficulty is getting the correct blends of the two.

55,336. Do you import cotton from the Colonies; for instance, Uganda and Kenya?—I have used the West African cotton.

55,337. Have you used Uganda?—I have not used Uganda.

55,338. A large quantity comes to Bombay and is sold at Rs.200 per *khandi* over and above Broach?—Yes, but the Uganda cotton we buy in Liverpool. If we buy African cotton of any description, we buy if from the ordinary merchant in Liverpool or Manchester; how he gets it we do not know.

55,339. Kenya has now commenced to grow cotton and it is of very good quality?—It all depends upon the staple; personally I am a short staple user, coarse count spinner.

55,340. There is a very good description of the various kinds of cotton in the Imperial Institute magazines; I suppose you get them?—Yes.

55,341. *Sir Thomas Middleton*: Reference was made to the ethics of the trade in accounting for variations in the cotton exported from Bombay; but may it not be that it is not so much the ethics of the trade as the want of a definite standard; you have got a shifting standard. I may point, for example, to your reference to the deterioration of Broach cotton,

which you ascribe to the change in the seed. There has been a great variation in the quality of Broach cotton over a period of years?—There has.

55,342. The standard has been departed from?—Yes.

55,343. The difficulty is that you have no fixed permanent standard to which you can refer?—That would be one of the advantages, that we suggest, of the universal standard types on the American system.

55,344. That is what the Americans have aimed at doing in their universal standard types?—Yes.

55,345. We have no such standards in India?—No, not so reliable. With regard to the American, each exchange has an exact copy of these standards; they can be matched anywhere.

55,346. In India, we classify our cottons according to the districts from which they come and the cottons from these districts vary over a long period of years in quality; therefore the meanings of the terms vary; the standards are departed from?—Yes, but that could be overcome as it is overcome with regard to American. The standards are revised every two years; it would not matter if the standard were revised every year, provided the buyer knew that a certain standard for that year was right.

55,347. I quite see that by following the American method we might accomplish what they have done; what I am pointing out is that it is not merely a matter of ethics but a matter of fixing standards; you must have definite standards?—You must have standards. But the question of ethics also comes in, when you get the mixed staples and fibres as well.

55,348. You say that this Broach cotton to which I have referred has been growing coarser?—Yes.

55,349. You think that this must be due to some deterioration in the seed?—That is our suggestion; we are not authorities on the growing.

55,350. You make the suggestion that fresh issues of seed should be made from Government farms, in order to counteract that tendency; but Broach cotton maintained its reputation for many years, long before there were any Government farms?—Yes; but from a Lancashire spinner's point of view, we claim it has lost that reputation.

55,351. What I suggest is that it is not the deterioration in the seed, but a change in the variety which is grown in the locality which is responsible?—To us it is the change in the type which has made it so that we cannot use it; we were a large user, and now we cannot use it.

55,352. It is, in fact, a somewhat different variety from that formerly grown, which is now being cultivated in the Broach district?—A coarser fibre.

55,353. Thirty years ago there was very little of this coarse type which has since become very common?—Yes. The state of things thirty years ago has still remained in our minds, because we were large users of it at that time.

55,354. *Dr. Hyder*: You advocate the use of saw gins for some varieties of cotton; are there any disadvantages in the use of saw gins?—The disadvantages are rather by report than actual experience. I have gone in for the saw-ginned for many years now. If one may use private names, I am speaking of Messrs. Ralli Brothers. I was the first to use the saw-ginned cotton in bulk when it was first introduced into Liverpool, and I have kept on for many years. I have found it a very great advantage for opening and mixing. I have asked to have several other types saw-ginned, but I have been informed by Messrs. Ralli Brothers that their people did not think they were suitable for saw-ginning. But last year I had at my own expense twenty bales, I think it was, of Cambodia cotton taken up country and saw-ginned. It was a perfect success; so that I am rather inclined to think that it is more the fact of not having the saw gins on the premises rather than that the cotton will not be successfully ginned.

Mr. James Littlewood.

55,355. Is there no difficulty in the heckling or cutting of the fibre?—In the two kinds I know, that is the Punjab American, of which I buy about 16,000 bales a year, and the Cambodia, up to now I have found no difficulty, no cutting and a better yarn.

55,356. *Sir Thomas Middleton*: They are both American types?—Yes.

55,357. The only saw-ginned cotton that previously existed in India was the Dharwar saw-ginned, which also was American?—Yes.

That is what you must have been buying.

55,358. *Sir Ganga Ram*: Messrs. Ralli Brothers have started saw gins now in Sind; they have put up a factory in Sind?—During the last year.

55,359. No, during the last two years, I think, and your Manager, Mr. Roberts, is putting up saw gins now. I suppose you get cotton from there?—Yes, we get it from there.

55,360. Do you find any difference in quality between the saw-ginned cotton and the other cotton?—Undoubtedly I should much prefer the saw-ginned; I will never again have roller-ginned cotton for my use if I can get saw-ginned.

55,361. Saw-ginning takes away more fluff, and if they are both purchased at the same price, it would not pay the man to put up a saw gin?—But I think they can make more money from the saw-ginned; personally, I would pay more money for it.

55,362. *Mr. Noyce*: How much Indian cotton is used in Lancashire?—Not much. That is a question I have not come prepared to answer; I think it is only on the top side of 100,000 bales. I am speaking from memory.

55,363. With regard to these spinning tests on Indian cotton, "twist" is the same as "warp," is it not?—Twist and warp are synonymous terms, yes; they are the same.

55,364. I was always under the impression that you could get a higher weft out of cotton than you could warp; but according to your tests, take Gadag No. 1, for instance, you get 40s warp and 25s weft; how is that?—The reason is this: we always put in a test that gives a higher count of weft you can spin a higher weft count than you can twist, for this reason, that you must have a stronger thread for the twist because it is the body of the cloth.

55,365. That is the reason why I should have thought if you could get a 30s warp you could get 35s or 36s weft?—You have weft 25s and twists 30s in Gadag No. 1.

55,366. I was looking at the nominal counts?—I should take rather the comments. The counts that are spun in the tests here are necessarily the counts that the spinner was doing at the time; he had to fit it in with the counts that he was spinning with his own ordinary settings; the comments give an expression of opinion of what the yarn would be really marketable at.

55,367. I wanted to bring that point out?—I will take a count here. Take the Sircar cotton, the two lots 14s and 25s; the counts that are tested there are only 12s, 16s and so on. It does not necessarily follow that that is the best count that that would spin, but the spinner was that sort of spinner; he was a coarse spinner.

55,368. These counts were what you actually got, not what you were trying to get?—Not what we were trying to get.

55,369. That is the point. Do you consider that any of these cottons that you have been testing are fit for anything above 30s?—Yes, I believe the Punjabs are well above 30s. There is a later test than this which, I am sorry, has not been sent on. We have tested the 285 and 289 Punjabs since this, at the request of Sir William Himbury. The counts that both of those were put to were in the neighbourhood of 50s and 60s. As Sir William considered that at the time the samples submitted of the 285 and 289 were not correct samples, we did a further test.

55,370. What is the best you can get out of Cambodia?—This particular Cambodia that was tested here is something that we do not see in England, except in samples. It is a remarkably fine cotton, a marketable yarn up to 30s counts alone.

55,371. That is not much use to Lancashire, is it? You do not want anything below 30s, do you?—Oh, yes. Our particular district is the home of the coarse count trade; we are all coarse counts. There are a lot of coarse counts done in Lancashire still.

55,372. What do you call coarse counts?—My average is 15s to 16s, and the whole of the district is that too.

55,373. Where does that go to?—Largely home trade and the Continent.

55,374. You do not send much to India, do you?—I do not send anything at all; I should think 32s to 40s is where the market starts there in bulk.

55,375. From Lancashire?—Yes.

55,376. With regard to the troubles you experienced in using Indian cotton, I suppose you are perfectly well aware that every matter that you have mentioned here is under the consideration of the Indian Central Cotton Committee, which is doing its best to improve things?—Yes, we have discussed these matters with them, so that when this enquiry came along we were compelled to use almost the same information that we have used with them for two years.

55,377. They are doing their best; I suppose you get their annual reports and see what they are doing?—Yes.

55,378. You do not get many bales of 500 lbs. from India, do you?—In the Tinnevellies and Cambodia quite a lot.

55,379. It is peculiar to the South of India; you do not get it from the North?—No.

55,380. Would there be any special advantage in having a clearing house for complaints in this country? Cannot you send them on either to the East India Cotton Association or the Indian Central Cotton Committee to deal with?—That is merely a suggestion for having a clearing house here, because we do not know that any complaint made to our own shipper here ever gets further than the shipper.

55,381. Cannot you send it to the Indian Central Cotton Committee; they would deal with it?—We would not care to whom we send it.

55,382. I should suggest you do, because they would be quite prepared to take action in order to stop any abuse you bring to their notice?—The ginning is a very important point; of course, we have stressed that. That is one of the difficulties that the American user in Lancashire finds: the amount of leaf and dirt that is left in, that is taken out at heavy loss, and, what is worse, the heavy amount that is left in the yarn. You will notice from some of the cotton losses in the test that is submitted here, they are very heavy.

55,383. That will depend, of course, largely on the part of India the cotton comes from; you get a very dirty leafy cotton from these Sircar types grown in the South?—Yes; I have used a Sircar.

55,384. Have you brought this question of establishing reliable standard types to the notice of the Indian Central Cotton Committee?—No, that is a thought that was put forward here for the first time.

55,385. That again is a point which is worth bringing to their notice?—Yes, we could do that.

55,386. The point is that in the Indian Central Cotton Committee you have got an excellent machinery for dealing with every aspect of the cotton trade now, and therefore it is worth your while to keep in close touch with them; I think you will find they will do all they can to help you?—Yes, I can readily see that, but up to now our discussions with the Indian Central Cotton Committee have been purely on quality.

55,387. They are concerned with every aspect of cotton?—Yes.

55,388. *The Chairman*: Would it be an advantage to you if there were an accredited representative of the Indian Central Cotton Committee in Liverpool to whom you could go?—I do not think it would be much use; I should think it would be a waste of time.

55,389. I thought he might save you the pains of corresponding at a distance, and might also act as a clearing house and afford a comparison of your complaints on particular points with complaints from other firms; but you do not think it worth while?—I think if they occasionally would communicate with the Oldham Association and ask for comments from the users of Indian cotton periodically, we could supply those.

55,390. From whom do you buy your Indian cotton? Who ships the Indian cotton that you buy: a firm handling only Indian cotton, or a firm handling Indian cotton and American too?—The bulk is bought from firms handling Indian cotton alone.

55,391. So that it is to their direct interest to encourage the consumption of Indian cotton as far as possible?—Undoubtedly.

55,392. Do you think as much is being done as might be done to advertise Indian cotton?—No, perhaps there is not as much being done as might be, but it requires the Indian cotton to be improved before it is really worth while advertising it too much. The best of the Indian cottons are extremely difficult to get for the people who want them.

55,393. But if it were possible to improve quality, and so to increase demand, then it might be worth while doing some rather active advertising; is that your view?—I think so, because I think there is a big market for Indian cotton of the right type.

55,394. *Professor Gangulee*: That is long staple?—I am speaking of staples from $\frac{15}{16}$ths of an inch upwards; possibly $\frac{7}{8}$ths could be used in our own district.

55,395. *Sir Thomas Middleton*: I understand you mix Indian and American cotton frequently?—Always.

55,396. Would a difficulty arise in mixing a saw-ginned cotton with a roller-ginned cotton? Do they mix easily?—They will mix, but you do not get as good a result as you do with all saw-ginned; you do not get as level a yarn, nor do you get as good a strength test.

55,397. The pulled saw-ginned cotton is more fluffy than the roller-ginned cotton; is not that so?—Yes, it makes a fuller thread.

55,398. So that if India desired to participate largely in the Lancashire market and did improve its varieties, it would also be necessary to alter its method of ginning and to adopt saw gins?—I should certainly say yes.

55,399. *Sir Henry Lawrence*: Is all American cotton saw-ginned?—No, it is not all saw-ginned; in fact it is principally roller-ginned, but it comes in a different form; it is a lighter density cotton and opens better It is the opening we are concerned with; we find the Indian roller-ginned cotton does not open so well; we cannot treat the fibres in the preparatory machinery in the roller-ginned as we can in the saw-ginned.

55,400. Then you would still have the difficulty which Sir Thomas just mentioned of the roller-ginned mixing with the saw-ginned?—No, I was referring to the mixing of two Indian qualities.

(*The witness withdrew.*)

Sir HERBERT ROBSON, K.B.E., of Messrs. Ross T. Smyth & Co., Ltd.

NOTE OF EVIDENCE.

My remarks with regard to the marketing of Indian grain refer to wheat, barley, gram, pulse, maize, etc., of which by far the most important is wheat. I regret that I have no knowledge of the marketing of rice.

It is pleasant to be able to state:—

(*a*) That in my opinion Indian grain is well marketed.

(*b*) Broadly speaking, Indian grain is sold on European markets by large European merchant shippers who purchase the grain either from the farmer or from the dealer in the interior of India. Only a small portion of the grain exported is purchased from dealers who trade in the ports of shipment or is consigned to European markets by native shippers. The European merchant shipper not only has his own purchasing houses in the interior of India, his own shipping houses at the ports, but has his own importing houses in the principal ports in Europe. In those importing ports where he has no place of business of his own the merchant shipper employs a broker. A very large proportion of Indian wheat which is milled in England is sold direct by the merchant shipper to the miller, while on the Continent of Europe the merchant shipper sells to the miller through a broker.

The merchant shippers are few in number; most of them are firms with very large financial resources.

The farmer or the dealer in the interior of India receives a cash payment upon delivery of his grain. This cash payment is often still made in silver rupees and not by cheques or by notes. The merchant shipper procures the funds, which he needs in India, either by telegraphic transfer from London or Paris or by selling three months or shorter-dated bills on his London House, such bills being negotiated by the large British banks established in India.

(*c*) I consider that Indian grain is most excellently packed and graded. Indian grain is almost the only grain which is always sold on a basis of analysis for impurity. The quality of it is usually very even, and the allowances which have to be paid by the seller to the buyer for inferiority of quality are usually only of minor importance. The bags in which Indian grain is packed are better than any other bags used in the grain trade and the stowage on ships is an example in excellence.

(*d*) The market information which the Indian cultivator and dealer now obtain is far superior to what was the case in years gone by. I believe that the movements of the principal markets of Europe and of America are known in the bazaars in India within a few hours of the close of these markets. The crop reports issued by the Provincial Governments in India compare for accuracy favourably with crop reports issued in other countries.

I hope that the Royal Commission may consider it to be satisfactory that I am unable to make any suggestions of a constructive nature for the improvement of the marketing of Indian grain, because I feel that the marketing compares favourably with the marketing of grain from any other country.

Oral Evidence.

55,401. *Sir Henry Lawrence*: Sir Herbert Robson, you are of Messrs. Ross T. Smyth & Company, Ltd. You have kindly given us this note of your evidence, and I observe from the conclusion of it that you consider the arrangements for marketing grain in India so satisfactory that you

are unable to make any suggestions of a constructive nature. Is there any further statement you wish to make on the subject of the wheat or other grain traffic?—I deal in grain in all parts of the world, North America and South America, and I have in days gone by dealt in grain in Russia; I have visited all those countries; as you know, I was for many years in India; and my deliberate conclusion is that the methods of handling grain from the merchant's point of view, and I think I may say from the Indian dealer's and the Indian agriculturist's point of view, probably involve the intervention of fewer middlemen than in any other country, and the grain is dealt with more directly between the Indian producer and the British or other European consumer than is the case with regard to any other grain anywhere in the world.

55,402. That is a very interesting statement; you say there are fewer middlemen in this grain traffic?—That is what I would say.

55,403. When your firm used to buy wheat in India, did they deal direct with the producer or did you have your agencies up country?—We had our own men employed in various parts of the United Provinces, the Punjab and Sind who bought sometimes direct from the producer, and, if not direct from the producer, direct from the producer's Indian dealer, who lived in the small bazaars in these various places in the Punjab and elsewhere. So that we got very closely in touch with them. There was only one middleman between us and the producer at the most, and in many cases none at all.

55,404. Could you offer any opinion as to what percentage of the world price of the grain actually went to the producer?—My experience in India is that the native of India is so extremely clever in his marketing that, as a rule, he was able to secure a better price on the day in India than the relative price at which the grain could be sold in Europe.

55,405. That opinion you base on ten years' experience of the markets of India?—Much more than that; I went out to India in 1899; I was there for thirteen years, and since then I have been very actively engaged in the business from this end; therefore I have had nearly thirty years' experience, and it is always the same: you can buy Karachi wheat to-day in London a great deal cheaper than you can buy it in Karachi or in the Punjab, counting in the rate of freight, the exchange and the charges.

55,406. *Mr. Noyce*: Who stands the loss?—The loss sometimes is stood by the exporter, but I say "on the day." This difference between the importing price and the price in the country of origin is a phenomenon that occurs in all classes of grain trade.

55,407. And in cotton?—And in cotton I have no doubt also.

55,408. *Sir Ganga Ram*: All over the world—All over the world, but it is more marked in India, I think, than anywhere.

55,409. *Sir Henry Lawrence*: Is the price of Indian wheat dependent on the price of Canadian or Argentine wheat, or has it got a separate market of its own?—Indian wheat has, to a certain extent, a market of its own. The price of all wheat is, of course, to some extent dependent upon the price of every other kind of wheat. It would be impossible to get a very much higher price for Indian wheat than for Canadian or Australian wheat; but I have known the times when the price of Indian wheat has been almost as high, if not as high, as Australian or No. 1 Canadian. At other times, when Indian wheat has been rather a glut on the market, the price has been very much lower. The price of Indian wheat can only be considered relatively to other classes of wheat.

55,410. I suppose it is always used blended in milling?—It is never used by itself in this country; it cannot be; no wheat from any one country is ever used by itself in this country.

55,411. *Sir Ganga Ram*: For milling, do you mean?—For milling. That statement must be qualified; when I say never, I mean commercially never.

There are a few mills still left in England that grind nothing slse but English wheat.

55,412. *Professor Gangulee*: What is the advantage of that mixing?—The advantage of the mixing is this: Indian wheat is very dry; it does not contain a very high percentage of gluten. If you have a loaf entirely made of Indian wheat it has rather too much of a nutty or a pea flavour about it, and the loaf is of poor size. If it is not mixed with some strong wheat, some glutinous wheat, such as Canadian wheat, your loaf will not have such a good appearance as it would have if it were mixed with a strong glutinous wheat. At the same time, you cannot use Canadian wheat by itself, nor can you use Australian wheat by itself. Flour, in this country, is always made from a mixture of various sorts of wheat; the proportions of that mixture vary from time to time according as one wheat is relatively more cheap than the other.

55,413. *Sir Henry Lawrence*: The exports of Indian wheat have been going down very considerably, have they not, in recent years?—Yes, unfortunately.

55,414. To what do you attribute that?—I think there are two main reasons. I think the principal reason is that the consumption of wheat in India has undoubtedly increased; that is one reason.

55,415. Owing to a rise in the standard of living?—Partly owing to a rise in the standard of living and partly owing to the increase of population; chiefly, I should think, owing to the rise in the standard of living. Secondly, India has been very unfortunate during the past few years; she has not had as good harvests as she might have had. Last year, and again this year, the harvest in the North-West Provinces, the United Provinces and in the Punjab, have been to a certain extent deficient.

55,416. That has especially affected the wheat crop, has it?—Wheat, gram, *jowar* and *bajri* are all to some extent interdependent; if you get a bad gram crop, there is naturally a bigger demand for wheat.

55,417. Do you expect an increasing export trade to grow up again in wheat?—That is a very difficult thing to estimate. The Government of India, as you know, have a very big scheme for a barrage at Sukkur, with an enormous area to come under new irrigation. That will probably have some effect, for a time, upon the export of wheat from India; one would hope so. But the tendency seems to be for India to consume more and more wheat. During the past four or five years there have been two or three periods during the winter when India has taken Australian wheat. Now, in days gone by that was almost unknown. India seems now to have got to a state where there is a very much larger population who eat wheaten bread under all circumstances.

55,418. Do you remember, at all, the figures of that import of Australian wheat?—I cannot tell it off hand; I could let you have it very quickly.

55,419. *Sir Thomas Middleton*: Was that in 1921 and 1922?—There was some during recent years; I do not mean only 1921 and 1922; there has been some during the last six months; during the last six months I should say 50,000 to 60,000 tons arrived in India about March-April.

55,420. *Sir Henry Lawrence*: I think it would be interesting if you would let us have the recent figures?—I can let you have those figures since the War at once.*

55,421. Thank you.—Most of that wheat goes to Bombay and Calcutta.

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* Shipments of Australian wheat to India:—

1st August to 31st July,	1924/25	...	4,198 tons.
,, ,,	1925/26	...	35,420 tons.
,, ,,	1926/27	...	40,467 tons.

55,422. Have you noticed any visible results as to the improvement of wheat through the introduction of what is known as Pusa varieties, or any other improved variety?—I cannot say that I have. What has happened in India, and I think it is the result of the new contract which was introduced in London about 1911 or 1912, is that I have noticed that the percentage of barley mixed in Indian wheat has tended to diminish very much indeed; Indian wheat, in other words, contains much less admixture than it used to do in days gone by. I may be wrong in my year, but before 1911 and 1912 all Indian wheat was sold without any analysis for dirt admixture or barley admixture; but the London Corn Trade Association introduced a new contract whereby Indian wheat, alone of all wheat in the world, on arrival in Europe was analysed for admixture; if it contained any valueless admixture such as dirt or valueless seed such as cockle, an allowance was paid for each percentage. With regard to barley, for every percentage of barley over two per cent. an allowance of half the contract rate was paid. It was very soon discovered that it did not pay you to pay ocean freight on things like dirt and seeds which were worth nothing, and it did not pay you to pay ocean freight and receive from your buyer half the value of wheat for barley mixed in wheat. That tended to stop the admixture of barley into wheat and to ensure the cultivator sowing a seed which was cleaner, whereby the wheat was not grown mixed with barley to the same extent as it was before.

55,423. Has that result been proved of recent years?—Indian wheat now arrives in this country with a very low admixture of valueless stuff such as dirt and seed, and the percentage of barley throughout the year probably does not average more than three per cent.; a good deal of it comes in at about three per cent.; it is unusual to see more than four per cent. That is a great improvement on twenty years ago, a very marked improvement.

55,424. But that wheat is not as pure as wheat from Canada or the Argentine?—I would not like to say from the Argentine; Canadian wheat does not contain any admixture as a rule; good Canadian wheat contains no admixture. Argentine wheat, unfortunately, in recent years, has tended to contain a certain percentage of black oats.

55,425. *Professor Gangulee*: What percentage of refraction do you allow in the trade?—Under the London Corn Trade Association you are allowed no refraction of dirt; all dirt is paid for at its full contract value, two per cent. of barley is allowed free, and anything over two per cent. pays at half the contract rate.

55,426. *Sir Henry Lawrence*: Is there any suggestion you can make which would lead to extension of wheat cultivation? Do you know of anything that hinders or handicaps the cultivation of wheat in India?—I do not. The average number of bushels of wheat per acre in India is low.

55,427. What do you think it is?—I cannot let you know exactly, but it is a matter which can be very easily ascertained. My impression is that in the Punjab it is about twelve bushels to the acre; I am not quite sure.

55,428. And in other parts of the world?—It varies enormously; Australia, which produces most beautiful wheat, has the lowest number of bushels per acre; it is a very remarkable thing. In this country, in a good year, it is sometimes as high as thirty-five bushels; I have known it as high as forty in Canada, and I have known it as low as eight in Canada; Canada varies more than any other place. The Argentine is about fifteen.

55,429. *Sir Ganga Ram*: You made the statement that no milling can be done without mixing; do you mean mixture of foreign wheat or only inter-provincial wheat?—I am referring to the milling which is done in this country. As a matter of actual practice, the flour in this country is always milled from an admixture of wheats from various parts of the world.

55,430. Not several parts of India?—No.

55,431. Do you know what is the freight of Australian wheat straight from Australia to London?—That varies very much indeed; at the present moment it is about 40s. a ton from Australia to London.

55,432. And from Australia to Bombay?—I cannot tell you off hand; it would probably be about 28s. to 30s.

55,433. From Australia to Karachi I know is eight annas a *maund*?—It would vary very much indeed.

55,434. *Sir Henry Lawrence*: That is 21s. a ton?—I am surprised to hear it is as low as that.

55,435. *Sir Ganga Ram*: When you see a quotation of wheat in the London market, is that quotation for pure wheat or with admixture of barley?—When you see a quotation on the London market, that is London contract terms; that is to say, pure as regards admixture of dirt or seed, but with two per cent. of barley. It allows two per cent. of barley.

55,436. Is that what you call standard wheat?—That is the standard contract under which the Indian wheat is all sold.

55,437. Do you give a premium if it is a pure wheat?—No, it is not customary to give a premium for wheat which contains no barley.

55,438. You charge a discount if it is more than two per cent.?—Yes.

55,439. Is not that one-sided?—No, I do not think it is, because very little Indian wheat comes over to this side without two per cent. of barley in it; it is very rare to see it.

55,440. What is your opinion about elevators? Do you think the spread of elevators in the Punjab will help you to export wheat at your convenience?—I think I was the first person in India who ever mooted the point about elevators; I had a long correspondence with various Government officials and with trade officials on the subject of putting up elevators in Karachi.

55,441. Are you in favour of it?—We were largely responsible for the erection of the elevator in Lyallpur and worked the elevator in Lyallpur for many years, in fact until last year.

55,442. Which firm do you belong to?—My firm in India was Messrs. Clements, Robson & Company. My own view is that in the present state of the export trade from India in wheat, with the possibility of India disappearing as an exporter from the international market, it would not be wise to put up elevators.

55,443. *Sir Henry Lawrence*: Are they not required for the internal trade?—I do not think they are required for the internal trade.

55,444. *Sir Ganga Ram*: When you buy the next crop forward, in the mouth of January, on what basis do you put your rates to the cultivators? Do you advance money to them?—No, never.

55,445. Yet you buy forward in the month of January?—Not very often.

55,446. Very often in the Punjab?—It is often done, but it is not done, you will find, by the bigger firms.

55,447. What I want to know is whether you do it merely on a speculative basis or whether you make contracts here?—If we do buy it in India, we make contracts here more or less at the same time. If we do not make contracts here, we sell an equivalent quantity of some other sort of wheat: either of actual wheat here or of wheat options at Liverpool, or wheat options in Chicago. It is not our business, and you will find it is not the business of any large firm of wheat merchants, to take up a broad speculative position; it is too dangerous.

55,448. *Sir James MacKenna*: Your considered opinion is that India does not give any great scope for the elevator?—That is my view.

55,449. Is it a fact that the Indian wheat comes in at a time of the year when supplies from other sources are not so ample, and fills the gap?—Yes, I think it is safe to say that.

Sir Herbert Robson.

55,450. The point is to get the wheat on to the sea as quickly as possible?—That used to be more true than it is to-day; in days gone by the Australian wheat crop, which is reaped in December-January, was a comparatively small affair; now it is a very important affair. Australian wheat is shipped freely during February, March, April, May; it is a long voyage; it is a two months' voyage by an ordinary tramp ship, and Australian wheat, owing to the short supplies of Indian wheat in many years, has taken the place of Indian wheat.

55,451. It overlaps the period in which Indian wheat used to fill the gap?—Yes.

55,452. Have you had some experience of dealing with Indian barley?—Yes, not so much as wheat, but I have had a certain amount.

55,453. Does much of that come over seas?—Not at the present moment. There have been years when it has been exported very freely.

55,454. What are the round figures?—I have all the figures here for the exports of the last few years.

55,455. Will you give them us?—These are in quarters. It varies enormously. 1913, 1,210,000 quarters. The War years I have not got, because it was all under Government control and it was not done on a commercial basis. 1919, only 72,000; 1920, 28,000; 1921, 62,000; 1922, 45,000; 1923, 253,000; 1924, 2,940,000: practically 3,000,000 quarters

55,456. *Sir Henry Lawrence*: Was that a new demand for a new purpose?—No, 1924 was a year when barley and all food-grain crops all over Europe were very short. There was a most abnormal demand for any form of food grain for the feeding of cattle. Barley, in particular, was very short; barley was so short in May, 1924, that I asked one of my brewer friends if he could secure me my supply of beer during the next year, because I was afraid there would be no beer. They brought barley out of every known quarter of the world and from places which had never exported barley before. India, of course, has always exported barley; but there being this most unusual demand, more barley was exported from India.

55,457. *Sir Ganga Ram*: Your firm do not buy barley in India?—Yes, we do.

55,458. Very little?—Yes, very little.

55,459. We have often offered it to them, but they will not buy?—We buy very little barley, but still we have bought barley.

55,460. Why do not you buy *masur* (lentil)? It all goes to France. It makes a very good malt they say?—We have never exported that ourselves.

55,461. *Sir Henry Lawrence*: Was this Indian barley found suitable for malting?—Some of it is very suitable.

55,462. The Sind and Punjab varieties in particular?—Yes.

55,463. Rewari barley is used?—Yes.

55,464. *Sir James MacKenna*: What was the 1924 figure?—2,940,000 quarters. That is easily the top. In 1925 it was 540,000 and in 1926 10,000. I have never seen a bigger variation in any set of figures.

55,465. It is a most extraordinary variation; what do you think was the cause?—The cause was that the price of barley went sky high in 1924.

Sir Ganga Ram: Although our production of wheat was so high that year, the export of wheat was small.

55,466. *Mr. Noyce*: We exported nearly as much barley as wheat?—Very nearly as much barley as wheat that year.

55,467. *Sir Henry Lawrence*: It is purely a question of price?—That was purely a question of price. The price of barley at one time went very nearly to the price of wheat, and good barley fetched a good deal more than the price of wheat: barley that you could malt well.

54,468. *Sir James MacKenna*: How does the Indian barley stand in the market in Europe?—It varies very much. You see you have two classes of barley generally used throughout Europe: you have barley which will malt and make beer, either good beer or bad beer; and you have barley which you use for feeding animals; in other words, for grinding. If you get a really fine barley which you can sell to Mr. Bass or somebody of that sort and get a fancy price for it, you may get three times as much for that barley as if it has been in any way deteriorated, or was originally of a poor quality so that it has to be ground for pig or cattle food.

55,469. *Mr. Calvert*: That is used for brewing?—Yes. I know the barley; it is a very good barley.

55,470. *Sir James MacKenna*: In a normal year, in what proportions would the barley be used for brewing purposes and for cattle food? I suppose the use as cattle food would predominate?—Yes, as a rule in a normal year; but when you have very little English barley and very little Pacific Coast barley, you have got to look round to see what barley you can get.

55,471. Is there a big export of gram?—Gram varies very much. I have not got the figures. Gram in 1924 was very important, but in normal years the trade in gram is comparatively small.

55,472. *Professor Gangulee*: It is chiefly used for feeding stuff, is it not?—It is entirely used for feeding stuff, and it is not used for feeding horses in this country or in Europe. The principal use for gram is for feeding young lambs; it makes a very good lamb food.

55,473. *Sir James MacKenna*: It is a very important horse ration in India?—It is.

55,474. Is there any great export of Indian pulses?—There is a very large trade done in Indian pulse from time to time.

55,475. Fairly steady?—Fairly steady, yes; they come chiefly from Calcutta and Bombay.

55,476. And maize?—Maize varies very much.

55,477. What is maize used for: cornflour and starch?—Oh no, the principal use of maize is for feeding pigs, partly cows and partly horses, but principally pigs. They feed maize to horses in Europe and they feed it to lots of horses in this country.

55,478. I suppose a certain amount is used for starch?—Yes, they make a certain amount, but that is negligible; the starch which you put in your shirt is not made from maize; it is made from rice principally. The cornflour that you make into a pudding is made from white maize, and most of that white maize is white North American maize. The Indian maize is rather too flinty, rather too hard, for making cornflour.

55,479. Does maize suffer much from dirt and adulteration?—No, the maize trade from India is more or less a negligible trade; it is a trade which only comes on when the maize crops in other parts of the world are poor. It fills a gap.

55,480. *Professor Gangulee*: Of these grains that you have mentioned, which has the greatest future?—Undoubtedly wheat.

55,481. It has been represented to us that there are signs of a steady deterioration of quality in wheat?—I do not think that is correct.

55,482. You do not subscribe to that view?—I do not think that is correct. Indian wheat varies in quality to a very, very small extent from year to year. We had one bad year in wheat from India in 1924, but that was because of heavy rain immediately after the harvest.

55,483. From the miller's point of view, what specific qualities in wheat should receive special attention?—That is a question I cannot answer, because a miller cannot use only Canadian wheat, only Australian wheat, only Argentine wheat or only Indian wheat; he must have a blend; he must mix them together.

Sir Herbert Robson.

55,484. When millers buy Indian wheat, what particular quality do they look for: softness of the wheat?—No, the first point is that it is very dry. Indian wheat is grown in an unusually hot climate, and Indian wheat is very dry. Secondly, a certain proportion of Indian wheat mixed in the grist before it is ground, that is to say, a certain proportion of Indian wheat among your flour, is very good for producing yeast in the bread; it promotes the growth of the yeast when the bread is fermented.

55,485. Have you any views on the system of grading wheat now in vogue?—Where?

55,486. In the export market wheats are graded, are they not?—In North America they are graded; only in North America.

55,487. Indian wheat is not graded?—No, no other wheat is graded except North American wheat.

55,488. Do you think it would be advantageous to Indian trade to have the wheat graded?—No, I do not think so. We have got a Commission over from the United States and another Commission over from Canada now, going into the whole question of their grading.

55,489. It has been suggested by a witness that in your grain contract in London, the unit has been changed from 492 lbs. to 480 lbs.?—Yes.

55,490. Has the change made any difference in the market in grain?—I do not think it has made any great difference. The only thing that has arisen is this, that Indian wheat used to look dearer than it really was. American wheat was quoted for 480 lbs.; the Argentine wheat was quoted for 480 lbs.: there was no discount off that. In the case of American wheat there was none at all, and in the case of Argentine there was a small discount for interest. In the case of Indian wheat it used to be sold for 492 lbs. and 2½ per cent. discount, and it made the quotation higher than it ought to have been; it was purely a question of quotation.

55,491. Do I correctly understand you to say that you think India may cease to be an exporting country?—I do think so; I think it is within the bounds of possibility.

55,492. Why?—Because of the internal consumption of wheat in India.

55,493. There may be an extension of the area under wheat?—Yes, but the population of India is very large; the proportion of people in India who eat wheat is comparatively small; your area which you can cultivate in wheat is to a large extent limited; you can have a new Sukkur Barrage scheme which is a wonderful thing, but you are apparently coming very near to the point when you cannot irrigate any further larger areas; there are no more areas that you can get at. I think your grandchildren may be importing wheat into India.

55,494. That is your prophesy?—It is not a prophesy; I think it is within the bounds of possibility.

55,495. In the United Kingdom the average yield, as you say, is as high as thirty-two bushels to the acre?—Yes.

55,496. In Canada the average is not more than fourteen?—I think it is more than that. You have got 1924 in that, which throws your average all out. 1924 was a disastrous year in Canada.

55,497. At any rate, the yield per acre in Canada is distinctly lower than the yield in the United Kingdom?—Yes.

55,498. Could you explain why the English wheat cannot compete with the Canadian wheat?—But I think it does. In what way do you mean cannot compete?

55,499. It cannot compete in price?—No, because Canadian wheat contains a very much smaller percentage of moisture to start with.

55,500. That is one of the cries of your English farmer, that he cannot compete with the imported wheat?—I know that is so, but the English farmer can always sell his wheat at a price. He cannot expect to get as good a price for his wheat under normal circumstances as the Canadian farmer gets, because his wheat is not so good and it is not so dry.

55,501. The point is that the increased yield does not necessarily mean a better price?—It may mean more money per acre.

55,502. Gross?—Gross.

55,503. *Mr. Calvert*: Not net?—No, the difference between fourteen and thirty-two per acre would certainly mean a bigger net yield per acre.

55,504. *Professor Gangulee*: I think, in answer to Sir Henry Lawrence, you suggested that we buy a good deal of wheat from Australia now?—You buy some wheat at certain times.

55,505. But only in the case of failure of the monsoon, not in normal years?—Not in normal years, no.

55,506. In 1921 and 1922 there was a failure of the monsoon?—1924 and the beginning of 1925.

55,507. That affected us and imports of wheat into India from Australia and the United States amounted to 440,000 tons?—Yes. In the end of 1924 and the beginning of 1925 India imported Australian wheat, and again at the end of 1926 and the beginning of 1927 they imported Australian wheat.

55,508. India imports wheat only in times of scarcity?—Yes; and it nearly all comes into Bombay and into Calcutta and is consumed there or thereabouts; it goes to the big mills.

55,509. One of the difficulties from which Indian agriculture suffers is that of introducing a better variety of grains in the market and getting a good price for it. Can you tell the Commission how a new variety of wheat may enter into the market?—Wheat is a very funny grain; if you take No. 1 Manitoba wheat and sow it in England, you will get the most extraordinary looking grain that you have even seen in your life; it bears no relation at all to its parent; it becomes inferior English wheat. If you sow the same wheat again in the Argentine, you get wheat which looks like an Argentine wheat, but it is not as good. If you take it over to Russia and sow it there, you get the same sort of result. It immediately reverts to the native type; it does not revert as a rule to the improved native type; it seems to revert to an aboriginal native type. If you were to sow the very finest wheat from any other part of the world in India, during your first season you would probably get something inferior to what you get now. In your second season, if you carefully selected the seed, you might be able to improve upon it. It is the soil and climate which determine the nature and quality of the grain, not the seed.

55,510. Let us assume we have evolved a new variety of wheat and that that wheat is better grain, its gluten percentage is higher and its milling qualities are superior to those of other existing varieties; how will that particular variety, call it Pusa 12 or Punjab No. 8, gain ground in the market?—It will very soon be discovered. Every big miller in Europe, and certainly every miller in this country, has a laboratory; he tests every lot of wheat he gets, most carefully. If he were to get a lot of Indian wheat which was superior and his neighbours got a lot of Indian wheat which was superior, you would soon find the market would respond. The millers would be bidding against each other rather higher prices to get that particular variety of wheat.

55,511. Looking through a Canadian report, I found that the Fife variety was superseded by another variety, the Marquis wheat?—Yes.

55,512. Recently they have evolved a new type, the Garnet type?—Yes.

55,513. Which is I understand again replacing the existing varieties?—No, I do not agree. The Garnet wheat is a wheat which ripens very quickly, but I do not think, in the long run, it will be used very freely in Canada, because the quality is not so good as that of the old type. Marquis is a variety of the Red Fife, and the Marquis wheat is used and sown very freely, but it would still be described as Red Fife.

Sir Herbert Robson.

55,514. Our difficulty is to know how we can push a new variety into the market?—But why do you want to push it?You want to keep on improving your own seed, naturally; but you will never, in India, produce a highly glutinous wheat; otherwise you would have done so before now; it would have happened of its own accord. All your wheat are comparatively soft wheats without much gluten.

55,515. We have hard wheat from the Central Provinces?—I think the main reason why you will never produce a glutinous wheat is that your climate will not allow you to sow in the spring. The Canadian wheat is sown in May. Indian wheat is a winter-sown wheat; it has to be sown in October, November, or at the latest December. It is a winter wheat, and winter wheat all over the world is a soft wheat.

55,516. *Mr. Calvert*: I have not quite understood this apparent conflict between the statement that all wheats are mixed for flour, and the other statement that the Indian wheat fills a gap here?—A miller wants, in his mixture, a certain proportion of strong wheat, glutinous wheat, and a certain proportion of lower glutinous wheats, softer, weaker wheats. Your main source of supply for strong wheat is Canada. Your next supply of strong wheat is the spring wheat States of the United States; that is to say, North and South Dakota and Minnesota. Beyond that you have Russia, which is doing practically nothing nowadays. The soft lower glutinous countries are Australia, Argentine, India and the Pacific Coast of the United States. A miller will mix some of these strong wheats from the three countries I have mentioned with a proportion of the weaker wheats from the four countries I have mentioned. If he cannot get any Indian, he will use more Australian or more Pacific Coast.

55,517. But the Indian wheat is said to come in a time gap?—It does come in a time gap; it begins to arrive here in the beginning of June, and it arrives in full volume in June, July and August. That is the normal time of its arrivel, just before the North American new crops are available. The North American new crops are reaped from the beginning of July to the end of August. They do not get over here much before the end of August. Australian wheat is beginning to become less plentiful than it was, we will say, during March, April and May; it is tending to tail off. Therefore Indian wheat used to fill, and does still fill to a small extent, a most important gap.

55,518. The gap in the soft wheats?—Yes.

55,519. In the Punjab, gram is second in area and second in value of all our produce?—Yes.

55,520. And latterly the price of gram in the Punjab has risen almost to equal wheat?—Yes.

55,521. In fact the price of gram is higher, sometimes, than the price of wheat the year before or the year after?—Yes.

55,522. So that there has been an enormous rise in the price of gram, and, as it is our second largest crop, it is very important to know what prospects there are for further marketing. There must have been a big demand to lead to such a huge rise in price?—There was a big demand in 1924, which was a freak year. You will find it is 1924-25.

55,523. The actual rise was 1918-19; in 1920-21 it was a very high price: Rs.6-5 a maund?—They were not actual War years but the world was suffering from the effects of the War.

55,524. In 1924-25 it went up and was higher than wheat used to be?—That was simply owing to the terribly bad feeding-crops they had all over Europe; there was no barley; the oat crop was more or less a failure everywhere; there was no hay; the potato crop was a disaster in Germany; the rye crop was one of the lowest on record in Germany, Poland and Holland The world had to get food for cattle from where it could get it,

regardless, to a certain extent, of price. But an export trade in gram is a trade which will not flourish.

55,525. Actually, the last twenty years has seen a very marked increase in the export of gram?—That may be, but there is no trade in gram being done at all at the present moment; there was practically none done last year. You have got to have a failure of some important crop before gram is going to be used.

55,526. You do not think there is a steadily increasing demand for gram outside India?—No, I do not. Gram is used because people cannot get something else, because they cannot get maize. Gram is used to take the place of maize. The country which supplies us with maize is the Argentine; the shipment during the past seven days from the Argentine is 1,100,000 quarters of maize; that is in one week. I have not the gram figures here, but I am quite sure that that is considerably greater than the greatest export of gram that India has ever done in a year.

55,527. *Sir Henry Lawrence*: To what extent is gram used for human consumption in Europe?—It is not used at all.

55,528. *Mr. Calvert*: Not even to adulterate wheat flour?—No, you cannot adulterate wheat anywhere in Europe.

55,529. For poor people I mean?—No, no, if you were to mix gram flour into bread here you would spend the rest of your life in jail.

55,530. Even in European countries?—In France they have certain regulations with regard to the admixture in bread; all bread has to have a certain admixture; but you must not mix gram flour in with bread flour, because it does not cook at the same rate, and you get very bad stuff.

55,531. *Sir Henry Lawrence*: When gram is used in Europe, it is entirely for cattle?—It is entirely for cattle food; for practical purposes it does nothing more than take the place of maize.

55,532. *Mr. Calvert*: We have nearly 6,000,000 acres under gram in the Punjab?—Yes.

55,533. It must go somewhere?—It is used in the Punjab, or it is eaten in India; it goes all over Northern India.

55,534. *Sir Henry Lawrence*: In India, it is chiefly used for human consumption?—It is, very largely; I should say, chiefly; but it is not so in Europe.

55,535. Would it not prove a nutritious and cheap food for Europe?—You cannot make the Englishman eat anything else but wheat.

55,536. What about the Continent and Scotland?—Italy is the only possible place where they might eat it; there they eat Pelenta, as you know, which is made from maize, and they might possibly eat it there; but it is very difficult to get a population nowadays to take up any new form of food. I believe that even the Scots are giving up the use of oats to a large extent.

55,537. *Professor Gangulee*: Would the development of sheep breeding in India perhaps cause a greater demand for gram?—Yes, but you cannot breed sheep in India; it is too hot.

55,538. *Sir Ganga Ram*: If wheats of different countries are placed before you, can you distinguish by the look of them?—Yes, at once, unless somebody put up some freak wheat that I had never seen before; but in ordinary circumstances, the wheats which are in daily trading I could tell at a glance.

55,539. Is not it a fact that people here do not know how to prepare gram for eating? In India we make the best sweetmeats out of gram?—I know.

55,540. And it is largely used for frying purposes?—Yes, and it is very good.

55,541. I suppose if those things were introduced here they would not go?—No, they would not look at them.

Sir Herbert Robson.

55,542. *Dr. Hyder*: There is a French sweetmeat in the making of which they use gram?—Yes, they may do that, but the quantity which is used for that is negligible: a couple of hundred tons probably in a whole year.

55,543. *Mr. Noyce*: One of the witnesses before us has advocated an earlier ripening wheat. He said that it you could secure an earlier ripening wheat in the Punjab and the United Provinces it would fill a gap in the European market. Have you any views on that?—No, that is a very short-sighted view, with all deference to the previous witness. You can get a premium, as a rule, for May shipment over June and July shipment; the sole reason that you can is because wheat is less plentiful, and there are certain millers in this country who very much prefer Karachi wheat to other wheats of the same type, and they will buy Karachi wheat whenever they can get it, provided they can get it at a reasonable price. Therefore, when Karachi wheat is scarce, as it very often is, in May, they will pay a small premium on May shipments over those of June. They would probably be prepared to pay a small premium on April shipments over May shipments, but it is very small.

55,544. It is not sufficient to justify the Agricultural Department in making any special effort to fill the gap?—No. If you do that, you will get your premium for April, but you will get none for May, because you will get the May demand supplied; you will get a premium for the earliest lot.

55,545. *Dr. Hyder*: When did the Russians sow wheat?—They sow two crops, a winter crop and a spring crop.

55,546. That is to say, the wheat is sown in winter?—The wheat is sown in Russia in October and November, say the 15th September to the 15th November; that is the Russian winter wheat. Then they sow again when the frost and snow are off the ground, say at the end of March or beginning of April.

55,547. When does it ripen and come to the market?—The winter Russian wheat ripens in July, and the spring Russian wheat ripens in August. In pre-Bolshevist days the Russian wheat used to move out from South Russia about the 15th August; it varied from year to year; I would say the 15th August would be about the average date when it began to move.

55,548. That is to say, the Russian came after the Indian?—Yes.

55,549. What comes before the Indian; is it the Canadian?—No, the Canadian does not come on until September; the two crops which come before the Indian, and almost together, are the Argentine crop and the Australian.

55,550. They are soft wheats?—Yes, the Australian wheat is a particularly soft wheat and a white wheat, the same as Indian wheat is.

55,551. When do the American wheats come?—The winter wheat from America starts moving overseas about the middle of July; the Canadian wheat comes next, moving overseas at the end of August.

55,552. You have a continual supply?—Every moment of the year there is some man sowing wheat in some field, and every moment of the year there is some man reaping wheat in some field; there is not a day which passes without wheat being sown or wheat being reaped somewhere or other in the world.

55,553. If there is a deficiency in one quarter, then that deficiency will reflect itself in higher prices obtained for crops from other countries?—That is what usually happens.

55,554. *Mr. Calvert*: If it is important to get the Indian wheat on to the market at certain periods of the year, is it then open to objection to encourage the Indian cultivator to hold up his stocks for three or four months in the hope of getting higher prices?—Why should you ask the Indian cultivator to speculate in the wheat market?

55,555. One of the commonest things we hear is that he should be encouraged or assisted to hold up his crop for higher prices?—How does the Indian cultivator, or I myself who am in the middle of it, or the greatest genius that has ever lived in the world, know what the weather is going to be like in the next few months? From the 15th April to the 15th July the American crop is made or marred. If the American crop proves to be a bad one, the Indian cultivator who has held up his crop will get a better price; if the American crop proves to be a good one, he will get a lower price. It is pure speculation.

55,556. It is actually better for the wheat trade as a whole, including the cultivator, that he should market it as soon as possible?—He should not throw his wheat on to the market and take any price for it; he wants sufficient power to be able to resist slumps caused by a glut.

55,557. But your actual export season is more or less confined to three months?—May, June and July, yes.

55,558. So that all these suggestions we hear as to encouraging him or enabling him to hold up his stocks are really not in his own interests?—I should say not in his own interests.

55,559. *Sir Thomas Middleton*: A great part of his stock is consumed in India?—Yes, a very high percentage is consumed internally. If he rushes it on to the market, he cannot expect to get his price.

55,560. *Dr. Hyder*: You have mentioned the critical period of the American market; from what month does it begin?—I should say from the 15th May to the 15th July; that is the most critical period.

55,561. *Sir Henry Lawrence*: The Indian export of wheat can never have any large effect on prices of the world, can it?—It used to have, but it has not had for some time.

55,562. Taking the broadest possible figures, I suppose the production of wheat of the world is about 100,000,000 tons; the Indian crop produces about 10,000,000, the maximum export being not much over 1,000,000 tons, that is one per cent. of the world's production. Are those figures fairly accurate?—The world's production of wheat is much more than 100,000,000 tons.

55,563. *Sir Thomas Middleton*: Would you say 120,000,000 tons?—I cannot tell you; nobody knows. You have certain wheat statistics put before you for the principal countries of the world; but there is a great deal of wheat grown in all sorts of places which never comes into commercial figures at all. There is the mass of wheat grown in China, for instance.

55,564. *Sir Henry Lawrence*: China is always left out of these calculations?—Yes. There is a lot of wheat from time to time sown in Central Asia which never enters anybody's calculations, but it would come out quick enough if the price got high enough.

55,565. The output of India is known more or less accurately?—Yes, the output of India we know accurately: more accurately probably than that of any other country.

55,566. What would you put that at?—It varies from time to time; one might say 10,000,000 tons.

55,567. And the biggest export we have had is about 1,500,000 tons?—No, nearly 2,000,000 as long ago as 1904.

55,568. *Sir Ganga Ram*: In pre-War days it used to be 3,000,000 tons?—No, the biggest export India has ever had was on the 1904 crop, that is 1904-5.

55,569. *Sir Henry Lawrence*: In recent years, it has fallen well below 1,000,000 tons?—Yes.

55,570. Down to what?—In 1922 it was just over 100,000 tons; in 1920 it was not much over 50,000 tons; in 1926 it was under 200,000 tons.

55,571. My point rather was this, that the Indian export trade is not of sufficient necessity to the world to enable it to control the prices in

any degree?—No. From 1904 to 1910 India had an effect, particularly in 1904 when it had a very marked effect on world prices of wheat; but of recent years it has had a comparatively small effect.

55,572. That reinforces your own argument that anybody in India who speculates in wheat is doing a very rash thing?—Yes.

55,573. *Sir Thomas Middleton*: With reference to barley, was any considerable quantity of that imported from India sold for brewing?—Yes, quite a proportion that year, in 1924.

55,574. Was the quality very steely?—It always is very steely.

55,575. Have the brewers succeeded in getting over the steely difficulty?—That I could not tell you.

55,576. I was told by a previous witness that they were more successful in dealing with steely barley than they had been before the War?—The brewer is the most conservative individual in the world. If you take five samples of barley and go to five brewers, they will all of them value them completely differently. A brewer buys barley like a woman buys clothes: one brewer likes a barley because it is one colour, just as a woman says she wants a pink dress while another wants a blue. You cannot argue about brewing barley; you cannot argue with a brewer about what particular barley he wants; he says: "I want that barley," and if he does not get it there is a row.

55,577. The enormous export of barley, you have pointed out, was the effect of price. There is a potential supply in India. If prices were to rise to the 1924 level, would you always expect a big export from India?—Yes.

55,578. Has there been no similar soaring in price in wheat since the War?—Yes, in 1924, the same year.

55,579. What was the effect on Indian trade in 1924?—India had not a very good wheat crop in 1924; what India did in 1924 was to sell her wheat after harvest and then buy Australian wheat about December and January to replace to a certain extent what she had already sold.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Friday the* 24*th June*, 1927.

Friday, June 24th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Mr. L. T. CARMICHAEL and Major NORMAN McLEOD, representing the INDIAN TEA ASSOCIATION (LONDON).

(*See also the evidence of the Indian Tea Association, Calcutta, pages 386-413. Volume IV, Bengal.*)

NOTE ON THE TEA CESS COMMITTEE'S OPERATIONS IN THE UNITED STATES OF AMERICA AND FRANCE.

Before reviving a campaign in the United States of America, the Tea Cess Committee deputed Mr. H. W. Newby (who was in charge of the Tea Cess work in India) to visit the U.S.A. and report on the prospects of commencing an advertising campaign in favour of India tea in that country. Mr. Newby reported that it would be inadvisable to undertake a campaign with a smaller sum than £20,000 per annum and strongly advocated an expenditure of double the amount. The Committee of the Indian Tea Association (London) supported Mr. Newby's idea and recommended the Tea Cess Committee to vote an annual allotment of £40,000.

The work was begun on the 1st January, 1924, and it was decided that the bulk of the funds should be expended in newspaper advertising. Sir Charles Higham, the well-known publicity agent, was consulted and his proposals for expending the funds were adopted. The selection of the newspapers to be utilised was left in his hands and the programme has been concentrated as much as possible in the largest cities.

In 1924-1925 the work was confined to New York, Boston and Philadelphia.

In 1925-1926 Chicago was included.

In 1926-1927 San Francisco, Los Angeles, Detroit, St. Louis, Cleveland and Baltimore were added.

In 1927-1928 about a quarter of the allotment is being expended in additional newspapers circulating in the Southern States. The remainder of the funds in newspapers as previously used covering the above-mentioned towns.

Special attention has been given to the question of distribution and to encouraging chain-stores and grocers to put on sale packets of India tea, or blends containing a large proportion of India tea.

Sir Charles Higham pays annual visits to the States and has secured much free publicity for India tea in this way. He has delivered several radio talks on India tea and attended conferences of the prominent tea distributors in most of the principal cities.

In support of the newspaper advertising, a special grant was made by the Tea Cess Committee of £10,500 for an exhibit of India tea at the Sesquicentennial Exposition, Philadelphia (June to November, 1926). An attractive stand was erected and cups of tea and small sample packets were given away free of cost to visitors. Many of the large distributing houses assisted in this work by supplying the sample packets of tea and helping in other ways.

Expenditure in the U.S.A. has been as follows:—

	£
1924-1925	60,000
1925-1926	40,000
1926-1927	40,000
1926-1927 (Special Grant to Philadelphia Exposition)	10,500
1927-1928	35,000

The aim of the present advertising is to create a general desire for tea drinking in the United States and India tea in particular, also to get as many packet tea people as possible to advertise their brands of tea next to the Tea Cess advertisements and to put packets of pure India tea, or a blend, on the market.

Some progress has been made in this direction, but the distributors have not taken advantage of the Tea Cess advertising to the extent expected, and the matter is now under further consideration.

While it is generally considered that, so far as newspaper advertising is concerned, the money has been well spent, there is some opinion that the time has now arrived when other methods should be tried, such as advertising in magazines to a limited extent, by means of demonstrations, etc.

Major Norman McLeod, the Vice-Chairman of this Association, has recently paid a visit to the United States to make enquiries on the spot as to results and to find out whether any improvement might be made in the methods of advertising. He has made certain suggestions and these are now under consideration.

The exports from India and Ceylon to the United States for the years prior to the advertising and since are as follows:—

India.

—	1922.	1923.	1924.	1925.	1926.
	(Lbs.)	(Lbs.)	(Lbs.)	(Lbs.)	(Lbs.)
Direct Shipments	4,660,186	5,355,559	6,367,132	5,015,139	6,227,294
Re-exports ...	2,439,017	2,767,957	3,886,702	7,549,508	4,384,747
Transhipments ...	2,511,336	3,324,854	4,655,369	5,610,325	4,600,982
	9,610,539	11,448,370	14,909,203	18,174,972	15,213,023

Ceylon.

—	1922.	1923.	1924.	1925.	1926.
	(Lbs.)	(Lbs.)	(Lbs.)	(Lbs.)	(Lbs.)
Direct Shipments	14,212,554	14,956,508	16,185,026	15,415,717	15,273,126
Re-exports ...	7,774,688	6,131,658	8,532,852	8,291,528	9,024,605
Transhipments ...	574,106	578,000	627,332	610,354	268,371
	22,561,348	21,666,166	25,345,210	24,317,599	24,566,102

The fiscal figures for all teas into the United States since 1921 are as follows:—

	India.	Ceylon.	Japan and Formosa.	China.	Java and Sumatra.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1921	7,814,500	20,516,913	24,650,362	11,023,026	6,923,998	71,501,250
1922	12,052,488	21,432,865	26,992,448	16,597,054	8,561,338	85,778,059
1923	10,869,266	23,803,702	36,920,877	14,278,116	9,821,079	95,990,816
1924	15,133,262	25,094,681	34,093,773	18,714,087	9,927,750	104,429,584
1925	15,747,892	26,090,471	30,597,882	10,227,183	9,330,566	92,841,333
1926	16,858,348	27,094,863	30,198,199	13,604,224	9,940,392	98,094,277

The total for each year includes blended India and Ceylon and teas from all other sources.

France.

This campaign was commenced in May, 1922, and the allotments have been as follows:—

	£
1922-23	11,500
1923-24	20,000
1924-25	22,000
1925-26	15,000
1926-27	10,000

The methods adopted included demonstrations in grocers' shops and cafés, cups of tea being given away and the proper method of brewing tea fully explained. Various means were utilised to attract people to the cafés and shops including advertising in the local press, circulars delivered in the streets, and notices on hand carts and sandwich boards taken through the streets. Efforts were made to get pastrycooks and confectioners to sell liquid tea and proprietors of mills and factories were approached for permission to introduce tea to the workpeople. Operations were commenced in the Loire section and, as one section was finished, an adjacent section was commenced until the whole country was covered, the sections being revisited at intervals to keep the campaign before the public and to obtain the continued interest of the shopkeepers selling India tea. At the demonstrations sample packets were given away and packets of Distributors' teas, approved by the Commissioner, were also on sale.

The following are the consumption figures of all teas:—

	lbs.
1921	2,457,180
1922	2,736,580
1923	2,978,360
1924	3,657,500
1925	3,832,840
1926	3,564,000

The exports from India and Ceylon to France from 1921 to 1926 are as follows:—

	India. lbs.	Ceylon. lbs.
1921	181,544	658,848
1922	308,508	1,307,428
1923	471,409	1,300,321
1924	403,580	1,098,726
1925	430,146	1,112,910
1926	398,753	1,477,349

As the rate of progress was not considered satisfactory the work in France was abandoned at the 31st March, 1927, and it is proposed to revive the campaign in Germany where progress was being made prior to the war.

My Committee would like to point out that the Tea Cess advertising has to be general advertising of a suggestion to drink India tea or more India tea and as no trading in tea is done by the Tea Cess Committee it becomes vital to obtain the support of distributors.

If the advertising could be concentrated on pushing a particular packet there is no doubt that more rapid progress would be made, but it will be understood that one distributor cannot be helped to the prejudice of all the rest and, for this reason, the Tea Cess Committee have not countenanced subsidising distributors. The linking-up of the advertising with the distribution has been the chief difficulty. It is not easy to persuade distributors to put up a special packet of India tea but some success has been obtained in this direction; until this becomes more general however results must necessarily be slow.

Oral Evidence.

55,580. *The Chairman*: Mr. L. T. Carmichael and Major Norman McLeod, you are attending on behalf of the Indian Tea Association of London, accompanied by Mr. Pease, the Secretary of your organisation?—Yes.

55,581. When we were in Calcutta we had the advantage of hearing evidence on behalf of the Indian Tea Association and the Indian Tea Cess Committee. I think that you are closely linked with the first of those bodies, are you not?—(*Mr. Carmichael.*) Yes.

55,582. In your view, is there sufficiently close touch between the organisations?—Yes, I think so. We are in weekly correspondence with them, and on most subjects references are exchanged between the two bodies. They are, in fact, identical in interest, I think I may say.

55,583. I think that the facts in relation to your organisation and the trade as a whole are before the Commission; but there are one or two questions of a general nature that we should like to ask you. The first is as to whether the reputation of Indian tea and the sales of Indian tea are holding their own in the world as the trade increases. Is India getting a fair share of the new business that is going?—Answering that generally, I should say yes. The share of business one gets in tea is very largely governed by the price; that is to say, if tea from North India is short in supply and therefore dearer than usual in this market, it is apt to affect the volume of our exports to other markets. Our general experience has been that when tea is dear our exports fall off to other markets apart from the home market, which is, of course, the principal market.

55,584. As far as the quality, grading, packing, and so on, of tea in India are concerned, I think you are in close touch with the organisations in India and so with the trade in India, and you are able to bring any complaints to the notice of the appropriate persons in the ordinary way?—Yes, entirely.

55,585. You are a completely organised industry?—We claim to be. In fact, it has struck me that tea, as grown in India, is one of the few Empire commodities handled by the grower until it reaches its ultimate market. We take care of it until it is put actually on the market; we do not sell it in the country of origin, as a rule, to middlemen or others who make what use they like of it. On that account it is a less speculative commodity than most others.

55,586. To deal for a moment with the campaign of advertisement which has been undertaken by the Tea Cess Committee, are you satisfied as an Association with the results that flow from that campaign?—(*Major McLeod.*) Generally speaking, I think we are. The shipments to America in 1922 were 9,600,000 lbs. In 1926 they were 15,000,000 lbs. In 1925 they were 18,000,000 lbs.

55,587. *Professor Gangulee*: Do you ascribe this increase to the advertising campaign or to market prices, competitive prices, with Java and other countries?—I should say that it was both. I ascribe the decrease in 1926 to the very high prices ruling during that year. When, in the beginning of this year, prices were low there was a decided increase in the exports to America.

55,588. *The Chairman*: In the case of the advertising campaign in France, although the percentage increase looks attractive, the cost of the campaign in relation to the increase of business that followed was not quite so impressive as in the case of America?—No. We decided to stop on that ground and possibly try other countries, like Germany.

55,589. Do you advertise in Australia?—I do not think that it is necessary in Australia, because there is a very big demand for tea in Australia. It is something very large.

55,590. Does the Indian Tea Association comprise practically all the firms dealing in Indian tea in this country?—(*Mr. Carmichael.*) All the growing firms.

55,591. Is it mainly concerned with the regulation of sales by auction, in this country, of consignments direct from tea gardens in India?—Not entirely.

55,592. Will you develop that a little and let us hear the scope of your activities?—We are ready at all times to deal with any matters that may arise in connection with the industry.

55,593. You also administer the funds placed at your disposal by the Indian Tea Cess Committee for the campaign of advertisement to which you made reference a moment ago?—Yes, subject to their direction.

55,594. I take it that, in most cases, the personnel of your London Association are members of the same firms that provide the membership of the Indian Association?—Very largely so. In the main I might say they are retired Anglo-Indians, men who have been in India themselves, in many cases, and have now come home.

55,595. So that the interlocking is complete?—Quite complete.

55,596. Are there any points which you would like to bring before the Commission other than those set out in your memorandum?—Your Questionnaire spoke about the question of marketing Indian tea. There is one point there that has occurred to me, and that is that there is no obligation on the buyer of tea (I am speaking particularly of this country) to indicate, in regard to the tea he puts before the public, what percentage of that tea is Indian or from elsewhere. We have often felt that it would be no detriment to our tea, but rather the reverse if the contents of a packet, say, were indicated as to the percentage of Indian tea, Ceylon tea or Java or Sumatra tea.

55,597. Where would the advantage lie, exactly, in that?—The consumer would then know what he was buying. At present he is not told anything as to what is contained in the packet of tea. It may be called by any

name. I think, speaking from an Empire point of view, that might be an advantage.

55,598. Have you any indications that consumers in this country are influenced, in their choice, by patriotic considerations?—Not specific indications; but I think that there is a general feeling that that might weigh with a fair number of consumers.

55,599. There is nothing that you wish to say about labour questions on the tea plantations in India?—Nothing in particular. I think that that has been dealt with fairly fully by Calcutta. We are all, naturally, hoping that the restrictions on the recruitment of labour for tea estates in India will be removed. It is the only industry, as I think your Commission has been told, that suffers from such restrictions. It is rather an invidious distinction, which we do not think is deserved.

55,600. *Sir Henry Lawrence*: Do you consider that those restrictions were imposed owing to conditions of labour that are now obsolete?—Yes, more or less obsolete. I think that labour flows now quite readily of its own accord according to economic conditions. We only ask for freedom to recruit labour where we can and as we can.

55,601. The tea industry affords a wide field for the employment of Indian labour?—Yes.

55,602. Have you any idea as to the number of Indian labourers employed in it?—I think that about three-quarters of a million people are employed in the industry in one way and another, and probably indirectly a good many more, the families and dependants being resident with them.

55,603. They come and go; it is a fluctuating labour force?—Yes. They are free to come and go as they like.

55,604. As regards the law, your complaint is that there is not freedom of incoming?—Yes, but we have no means of preventing them from going as they please and when they please.

55,605. Is the fluctuating portion of the three-quarters of a million large or small?—Fairly large, I should say.

55,606. So the actual recruitment of new men to take the place of men who go out is a heavy financial charge on the industry?—Yes, very heavy.

55,607. I understand that you addressed the Government of India in September last in regard to the alteration of the law?—Yes.

55,608. Has any reply been received from the Government of India in regard to that representation?—I do not think so. There has been no definite reply so far. That letter, of course, was sent from the Calcutta Association, but they naturally keep us informed.

55,609. You do not know what further stage the negotiations may have reached?—I understand that the Government of India is in consultation with the Provincial Governments on the whole question of the recruitment of labour for the tea estates and has invited their opinions, but beyond that I do not know what has happened.

55,610. So there is some chance of your getting these restrictions modified?—We hope so.

55,611. What proportion of the capital which is employed in the tea industry is subscribed by Indians?—I have not the figures offhand, but there is a considerable number now of estates owned and managed by Indians themselves, particularly in the Dooars district, and very prosperous many of them are.

55,612. Have you any view at all as to the proportion that capital bears to the total?—I have not actual information, but, speaking offhand, I should imagine it is at least 10 per cent.

55,613. Is there a tendency, now, for Indian capital to be attracted into this industry when new gardens are opened?—There has been this tendency within the last ten or fifteen years, certainly, owing to the fairly prosperous condition of the industry. It has been attracted, no doubt.

55,614. Is that a growing tendency?—I think so, yes. I certainly know of quite a number of new estates opened out within that period by Indians and managed by Indians.

55,615. As to the new gardens being opened up, a considerable proportion are Indian owned and Indian worked?—Yes.

55,616. Is it the case that the existing restrictions bear most heavily on the opening of new gardens?—Not most heavily; equally heavily, certainly.

55,617. I see that it is stated in that letter that new gardens are particularly handicapped because they have no *sirdars* in existence whom they can send to recruit?—To that extent they are. They have no nucleus, as it were, through which to form new connections.

55,618. When there are no *sirdars*, how does a new garden start to get labour?—Generally, by attracting labour from its neighbours by inducements of various sorts.

55,619. *Professor Gangulee*: Better wages?—Sometimes; but not so much wages as payments, that is to say, a bonus for the recruitment of new coolies, new labour. But our experience is that labour as such is attracted to new gardens, because they know that there is plenty of work going and good wages, and I think that it is quite a general rule that a new garden fills up more quickly than an old garden.

55,620. *The Chairman*: Attractive promises as to grants of land after a certain number of years' service?—That is not the determining factor, or I should not think so. They can always get that. (*Major McLeod.*) They are very very fond of a change, and they say, "There is a new estate. Let us go along and try it." Without any particular reason, they very often go to a new garden. In fact, they like a new garden. It is a change for them.

55,621. *Sir Henry Lawrence*: It was suggested to me in Calcutta that the difficulties which the Government of India have experienced in modifying the law are more largely due to political prejudice than to the actual economic conditions existing now. Is that your view?—(*Mr. Carmichael.*) It is certainly my view that the economic conditions are not the objection to any modification of the law.

55,622. It is said that the political prejudice is based on the previous history of the industry and that it is largely due to lack of knowledge of the conditions now existing?—I think that that is so. The Minister of Labour there went for a tour, I believe, through the tea districts, and was very favourably impressed with the conditions.

55,623. The present Minister for Labour?—Yes.

55,624. Does your Association do anything to bring before the public in India a more correct view of the existing conditions?—We have done so in various ways through the Tea Districts Labour Association. It has issued, in half a dozen different dialects at least, pamphlets dealing with the conditions of the tea estates and telling the people whom we hope to recruit what the conditions are.

55,625. I am thinking more of propaganda in political circles?—That has not been very active hitherto, as far as I know.

55,626. It is alleged against the industry that it is paying very low wages?—Yes.

55,627. On the other hand, it was said to me in Calcutta that these low wages represent a very small amount of work and that the labourers are free to devote a good deal of time to their own allotments?—That is so.

55,628. Is that a universal rule that they all have time to devote to their allotments?—Yes.

55,629. And they all have allotments to which they can devote time?—If they want them. Some classes of labour do not take to that form of work very much. The Madrasi people and South Indian people, for example (we have a few up in North India) are not so keen on agriculture or on having their own plots as the Central Provinces men, for example.

55,630. For anything over a certain fixed time of work the labourers get overtime allowances, do they?—Yes. It is, perhaps, unfortunate that our method of wage expression has given rise to the feeling that wages are low. We as a rule state that the day's task is worth so much. As a matter of fact, the day's task is accomplished usually in a very few hours.

55,631. That is a very vital fact which does not seem to be very widely known?—It is becoming more known now, because we have realised the disadvantage to which we are put by that form of wage expression.

55,632. *Sir Thomas Middleton*: In connection with your publicity work, are you in contact with the Empire Marketing Board?—We have endeavoured to be in contact with them, but they did not give us much encouragement. We wrote them a letter on the formation of the Board, suggesting that we were a worthy object for support, and, to be quite blunt, we were turned down.

55,633. Was any reason given?—No, no reason was given.

55,634. Perhaps, from the fact that you had been finding money for publicity yourselves, they thought that you had enough to spend on publicity?—I do not know what may have actuated them; they did not give us any reason for it. They thanked us for our communication and hoped to keep in touch with us, but that was all we got out of them.

55,635. The room for expansion in tea consumption seems to be very great indeed?—Yes, we hope that it is.

55,636. Has any survey been made of the possibilities of the future? If you take the past fifty years, Indian exports have gone up from about 100,000,000 lb. to about 300,000,000?—350,000,000.

55,637. That is to say, exports have increased 250 per cent. in fifty years? —Yes.

55,638. Is there anyone in your Association who is trying to survey and estimate the future expansion?—As to the possibilities?

55,639. Yes?—We are doing it by this propaganda work in America, which we regard as a big field for expansion. It has a large population and a well-to-do population. They are able to afford tea. That was one of the troubles in France, that we felt that they could not afford to buy tea. But that does not apply in America, and we hope that it will not continue to apply all the time in Russia, which is also another very large potential consumer. (*Major McLeod.*) There are well over 100,000,000 people in America drinking three-quarters of a pound up to a pound of tea, and if you were to double it you would not have enough tea to go round.

55,640. You employ, in India, a considerable number of experts. The Indian Tea Association have a laboratory at Jorhat?—Yes.

55,641. How are these experts procured? Are they engaged through your Association in London?—(*Mr. Carmichael.*) Yes, usually. I think that we have sent out through our Association every one of the men now employed there. (*Major McLeod.*) We used to have the assistance of Professor Lefroy.

55,642. What is your usual method of setting about it? Do you approach the Appointments Boards of the Universities?—(*Mr. Carmichael.*) That is one way. We have done it in that way, and we have consulted well-known experts in their own line in this country and endeavoured to get into touch with suitable men.

55,643. The Indian tea gardens are now consuming considerable quantities of fertilisers. Do you take any steps on this side to aid them in procuring their supplies, or do you leave it to the individual planters?—To the agents in Calcutta generally. There are several firms in Calcutta who have taken up the importation of fertilisers.

55,644. You are never being called upon to assist in that direction?—No, we have not been. (*Major McLeod.*) We send out from this end usually in the case of gardens controlled from London. (*Mr. Carmichael.*) But not as an Association.

55,645. *Dr. Hyder*: Is Indian tea losing ground in the Australian market as against Java tea and other varieties of tea?—Yes, undoubtedly.

55,646. To what is this due?—They tell us that it is a matter of price. They can get Java tea cheaper. It is nearer the source of supply, and the people in Java have been making strenuous efforts to capture new markets in order to provide for their increasing crops.

55,647. What about the Russian market?—We are hoping to get that back when they have money to buy tea with.

55,648. Did they drink tea of a particular variety, say, green tea?—No, mainly black tea.

55,649. Not green tea?—They drink a certain amount of green tea round the Caucasus and that way, but in Russia proper it is mainly black tea.

55,650. With regard to the recruitment of labour, is this recruitment done on behalf of and for the employers by the Association, or is it carried on by the individual employers?—It is done through the medium of the Tea Districts Labour Association, which is kept in being and subsidised by the different Tea Companies in India in order to avoid competition amongst ourselves.

55,651. With regard to the pushing of tea on the Continent, do you think that there is any scope in connection with coffee shops, cocoa shops, confectioners' stores, on the Continent?—We have had a man who is conversant with the tea market in Germany over there lately, and he gives us a very encouraging report of the conditions there, and he suggests that we might start a campaign in Germany with great success. I think that I am right in saying that. (*Mr. Carmichael.*) Yes.

55,652. *Mr. Noyce*: What are the relations of the tea industry in Southern India with your Association?—They are affiliated. They have their own organisation; but, for example, in the case of the Tea Cess they contribute their proportion of that according to their production of tea.

55,653. The United Planters' Association of Southern India is a separate organisation, I know. Are you in the same relation with it over here as you are with the other organisation in Calcutta?—No; they have their own organisation in London.

55,654. Would it not be an advantage to have a combined Association for the whole of the Indian tea industry?—That is a useful suggestion. It may come about in time, I think. I do not know that it has ever been seriously considered hitherto. It is a growing country; that is to say, the production of tea in South India is increasing.

55,655. I should have thought that the interests of the Indian tea industry could be taken as a whole, so to speak, and that, though distance makes it advisable to have two separate Associations in India, one Association could perform all the work that is required in this country?—Yes. As far as their external relations are concerned they do participate equally with us in the Tea Cess and they also contribute to our research laboratories, and so on, in Tocklai in Jorhat. They get the benefit of the scientific knowledge acquired there.

55,656. Your relations are perfectly friendly; there is no question of competition between the two parts of India?—Perfectly friendly.

55,657. *Sir Henry Lawrence*: Is there a Ceylon Association?—Yes.

55,658. Is that linked up with you?—No. We occasionally consult if there is a point of common interest, but we are not affiliated in any way whatever.

55,659. You are rivals, not friends?—Friendly rivals.

55,660. *Mr. Noyce*: With regard to these figures of exports, you show the exports from India under three heads, direct shipments, re-exports and transhipments?—Yes.

55,661. Are the re-exports the re-exports from this country?—Yes.

55,662. And the transhipments?—They are also from this country. It is merely a distinction. They are also re-exports; but they are dealt with separately by the Board of Trade, and that is why we show them separately.

Mr. L. T. Carmichael and Major Norman McLeod.

55,663. *Sir James MacKenna*: Is not Java tea rather inferior in quality as compared with Indian and Ceylon?—Speaking very generally, yes. There are certain qualities of Java tea that are as good as any produced in other countries; but the bulk of it, I should say, is inferior.

55,664. What is Australia taking: the cheap tea?—The cheap tea, we are informed.

55,665. Does it score in the matter of freight through being somewhat nearer?—I should say so.

55,666. What about the big areas in Japan and Formosa: what is the quality of the tea from there?—Mainly green tea or semi-fermented tea. They have a very big grip on the United States. (*Major McLeod*): Largely in Central America.

55,667. How does Indian tea stand with regard to Ceylon tea?—As regards quality?

55,668. Quality and price?—The quality and price of Ceylon tea have been above Indian for some time past.

55,669. Twopence?—Up to fourpence, even, at one time.

55,670. How do you account for that? Better climatic conditions?—Mainly because the bulk of the Ceylon tea is grown at higher elevations. Most of the low-grown tea was replaced by rubber at the time of the depression in tea.

55,671. As to this allotment system, has it not rather "come back" on you; that is to say, where allotments have been established for a long time the tendency is for labour now to turn more attention to its allotments and break away from the estates?—Yes.

55,672. Has that been an important factor?—Yes, particularly in places like Assam. I think that we may claim to have peopled Assam.

55,673. At the expense and to the detriment of the estates?—Yes.

55,674. *Sir Henry Lawrence*: The estate retains control of its allotments?—When they are on its own ground; but many of the time-expired coolies have taken up land immediately adjoining the estate.

55,675. Does that hurt the tea estate?—We get casual work from them sometimes. Some gardens depend a good deal on what is known as *busti* labour, outside labour; but it is not a dependable source of supply.

55,676. *Sir James MacKenna*: They make enough money while they are employed on the estates to acquire land outside?—Yes.

55,677. *Professor Gangulee*: Recently there has been a good deal of controversy over the question of the quality *versus* the quantity of tea produced?—Yes.

55,678. What, exactly, is the policy of the Association?—To produce as good quality as we can and not to go for quantity.

55,679. It is mentioned in the Report of the Food Council that the public taste for tea in Great Britain has greatly improved, and you, I understand, sell better quality tea in the English market; but for quantity you look to the Continental market: is that right?—I would not quite put it on that ground. The quality is taken by people who appreciate quality. Possibly the lower grades of tea may make an entry into the Continent on account of their cheapness; but we do not deliberately set out to make a cheaper quality for other markets than for this market.

55,680. The demand for cheaper quality is elsewhere, not in the United Kingdom so much?—Mainly.

55,681. With regard to the competition by all the other countries that are now producing tea outside India, which country or countries, do you think, would enter into competition with us seriously?—Java and Sumatra, and in the future mainly Sumatra. Considerable areas of tea have been put out there during the past 10 to 15 years, and they very soon will be coming into bearing and will be producing a larger crop.

55,682. What about the quality? India hopes to retain her position by quality?—We hope to.

55,683. Not by quantity?—Not by quantity.

55,684. In Ceylon there has been, in recent years, an increase of about five and a-half million pounds?—Yes.

55,685. Ceylon is not likely to enter into serious competition with India?—Not beyond that extent. They are at about the limit of their productive capacity.

55,686. Even Kenya Colony is going to grow tea?—We do not fear competition from there. I think that the production there will be very small for many years to come.

55,687. I find from the figures that the *per capita* consumption of coffee is about eleven pounds?—Yes.

55,688. Do you think that coffee growing is going to be a serious competitor to the tea industry?—(*Major McLeod*) I should say that tea would be the serious competitor of coffee in a few years.

55,689. Jamaica, Tanganyika and other countries are extending their coffee plantations enormously. I was wondering whether coffee would enter into the market and compete with tea. Do you think that there is a tendency that way?—The Americans are essentially a coffee drinking people, as you can see from the figures. The figure is nearly twelve pounds a head. (*Mr. Carmichael*) And the coffee growers are very active in their campaign to push their own goods.

55,690. As to the Continental market, has it reached its pre-war level?—Germany has.

55,691. And other countries have not?—Other countries have not yet.

55,692. Russia used to consume about 160,000,000 lb. of tea per year?—Yes.

55,693. Out of which, I find, 70,000,000 lb. were grown in British territories?—Yes.

55,694. Are you doing anything to recapture that market?—(*Major McLeod*): We are not allowed to do anything. We would be only too glad to trade with Russia. It is a Government monopoly. They will not even allow us to send any tea there free as an advertisement.

55,695. It is an enormous market?—Yes.

55,696. And a very good market if you were allowed to work it. Is your Association making any representation to the Government to that effect?—I was interested in a small Company that was sending tea into Russia, and when they found that we were making a profit they shut it down and said, "You cannot send any more."

55,697. *Sir James MacKenna*: You mean the Soviet?—Yes.

55,698. *Professor Gangulee*: As to the advertising campaign, I see a rather interesting note here saying that you utilise radio for propaganda?—Yes.

55,699. Is that a very effective means of propaganda?—Very. (*Mr. Carmichael*): It reaches a very large number of people. What the direct result is we cannot yet say.

55,700. We have some information about the constitution of the agency which collects this Tea Cess; but I am not quite clear whether any representative of the Indian growers sits on the Committee?—I think that there is one, certainly.

55,701. And the amount of money that is produced by the Cess is entirely devoted to propaganda work?—Entirely, both in India and in other countries. (*Major McLeod*): There are a very large number of Indians employed in India in the propaganda there.

55,702. With regard to the question of labour, to which Sir Henry Lawrence referred, have you any definite suggestion as to how the Govern-

ment of India can modify their restrictions?—(*Mr. Carmichael*): By removing the objection they have to our recruiting in certain areas.

55,703. You do not propose the indenture system of labour, I hope?—No. We want labour to be free.

55,704. What difference does the restriction make?—It is more and more difficult and more and more expensive to get labour in that way.

55,705. Is it more under Government supervision?—No; but the Government do restrict us, that is to say, our area of recruitment is restricted. We are not free to ask a labourer in any part of India to go to Assam or Sylhet.

55,706. *Mr. Calvert*: From these competing countries, such as Japan, Formosa, China, Java and Sumatra, does there emanate any similar sort of organised campaign of advertising in the same area as that in which you are working?—In the case of Japan, Java and Sumatra, they are advertising in the United States very largely.

55,707. In the same area in which you are working?—Yes. (*Major McLeod*): Not quite. I have just come back from there. They are advertising entirely through magazines. We are advertising entirely through newspapers. (*Mr. Carmichael*): They are touching the same population.

55,708. You do not have the field to yourself?—No.

55,709. You have mentioned that a great deal depends upon the price. Does the fact that a tea cess has been taken in any way handicap you in price?—Not the least. It is a question of supply and demand entirely.

55,710. *Mr. Kamat*: What, roughly, has been the total revenue from the tea cess for, say, the last two years?—About twelve lakhs of rupees per annum, about £90,000 yearly. It depends on the extent of the crop, of course, because it is levied at so much a pound.

55,711. Six annas per hundred pounds?—Yes; so it varies to the extent that the crop varies.

55,712. The bulk is spent chiefly on advertising and publicity?—The whole of it in publicity in different forms.

55,713. Are you precluded from spending any portion of it on the welfare of the labour you employ?—Yes. The cess is administered under an Act of the Government of India and it is one of the conditions of the Act that it is entirely for publicity purposes for promoting the sale of Indian tea. So far as I remember, speaking offhand, it is entirely for publicity.

55,714. On the Committee which administers the fund is there any representative of labour? Has that stage come yet?—Of labour as labour?

55,715. Yes?—No.

55,716. You think that the time is not yet ripe for that?—I do not think that there is any particular connection between labour and the Tea Cess Act. The cess is raised for a specific purpose.

55,717. I see. Apart from the Act, do you look to the welfare of the labourers, their sanitation and other things?—Yes, very large sums are spent on the welfare of labour, and the health of the labour on tea estates is, I think, without exception very much above the health of the surrounding country in every district.

55,718. You look to the health of the labour; but do you look also to the education of the children?—Yes; schools are established on most of the tea gardens, on almost every one, I should say.

55,719. Reference was made to the political prejudice about the treatment of labour and to the propaganda carried on to remove that political prejudice. Can you amplify that and tell us how you have tried to remove that prejudice?—I think that we have endeavoured to show that the conditions of labour on tea estates are, as I say, equal to, and in most cases better than those in agricultural areas.

55,720. Have you shown in that propaganda that the rates of wages you pay to your labour are on the same level as, or on a better level than, the wages which the men get elsewhere in other industries?—We have tried to show that.

55,721. Have you clearly pointed out that the level of your wages is perfectly satisfactory as compared with the level of wages in other industries?—Yes.

55,722. *Dr. Hyder*: To what extent does Ceylon tea compete with Indian tea, and to what extent are these two teas blended together and sold as one kind of tea? Is Ceylon tea mainly a rival of Indian tea or is it complementary to Indian tea?—I should say that it is both.

55,723. Which element predominates?—One is not essential to the other; that is to say, each can be drunk separately with pleasure.

55,724. Why cannot the tea interests of the whole of the British Empire have one common organisation and push tea all over the world?—(*Major McLeod*): That is just the very thing we are trying to get. It is one of the things I have recommended on coming back from America, that the whole of the tea producers should combine together and organise an enormous publicity campaign.

55,725. There is this tendency to combine in other industries, and here you are isolated, each pushing his own wares and wasting money?—(*Mr. Carmichael*): We have been endeavouring, for some time past, to convince our friends in Ceylon that they should join us in a campaign of publicity for Empire tea generally.

55,726. *Sir Henry Lawrence*: To what extent is the Sumatra tea competing with you now? What is their production?—About 18,000,000 lb. per annum at present.

55,727. About five per cent. of your Indian tea?—Yes, not more than that at present.

55,728. And Japan and Formosa?—About 40,000,000 lb., I think it is. It is difficult to get figures of production. All we can get is figures of export. Perhaps it is more than that.

55,729. Of these the Sumatra crop is growing most rapidly in size?—It will grow most rapidly, probably. That is our feeling.

55,730. Japan and Formosa are not coming up?—Not so largely, no.

55,731. *Sir James MacKenna*: Which is the greater producer, Ceylon or India?—(*Major McLeod*): India. (*Mr. Carmichael*): India, undoubtedly.

55,732. *The Chairman*: Do the firms who are members of your Association do an important business with the Co-operative Wholesale Society in this country?—The Society buys very largely in the tea auctions.

55,733. Have they their own tea plantations in India?—I believe that they have bought a few estates. (*Major McLeod*): I know one they bought. They paid an enormous sum of money for it.

55,734. Perhaps it was a very good garden?—It was a splendid sale for the then proprietor.

55,735. Where does the Russian Government buy its tea?—(*Mr. Carmichael*): Anywhere. They have bought a certain amount in this country, through the Centrosoyuz, I believe, mainly.

55,736. From members of your Association?—They may have.

55,737. Where do the Centrosoyuz buy?—In the auctions, in the ordinary way, through a broker. I am giving information that I cannot verify, but that is what we learn by common rumour.

55,738. I was only concerned to discover whether the demand of Russia for tea was still being satisfied by the Indian market?—We shipped about 12,000,000 lb. of Indian tea to Russia last year. That is only one-tenth, or less, of what they used to take.

(*The witness withdrew.*)

Mr. L. T. Carmichael and Major Norman McLeod.

Sir DAVID CHADWICK, C.S.I,, C.I.E., Secretary, Imperial Economic Committee.

MEMORANDUM.

General.

Eleven years have elapsed since I was closely associated with the work of the Agricultural Departments in India. Consequently I do not feel competent to speak either about the details of their recent work or the organisation of those Departments. I have especially been asked questions connected with trade and commerce.

Before I deal with those particular questions, I would draw attention to a few general points connected with

(*a*) the foreign trade of India;

(*b*) domestic trade in India.

Foreign Trade.

India, in the total value of its foreign trade (imports plus exports), ranks fifth or sixth among all the countries of the world. This enormous trade rests primarily on her capacity to export surplus tropical agricultural produce and the readiness (almost eagerness) of the world to absorb such produce in increasing quantities. For many years she has enjoyed exceptional facilities for developing such trade. That position is not in the future likely to be so unchallenged as it has been in the past.

A comparison of the values of imports of food, drink, tobacco and raw materials into the United Kingdom in 1911 and in 1925 (a period of only 14 years) from India, and the Crown Colonies with the Mandated Territories respectively indicate the trend of events. Thus:—

Total value of imports into United Kingdom of these commodities according to Board of Trade returns.

	In 1911.	In 1925.
From India	39 million £	66.6 million £
From Crown Colonies and Mandated Territories ...	24.8 ,, £	78.4 ,, £

Deductions should not be pressed too closely from these figures because, clearly, they are subject to many qualifications, but they do indicate the likelihood (practical certainty) that in many of her commodities India must expect in the future to meet greater competition in the world's markets. It is not a matter for alarm because:—

(*a*) India has, and will have for many years, great advantages over these new countries, owing to her established world connections and her settled condition.

(*b*) The competition which she will have to meet should have the effect of causing her to take greater care over the preparation and shipment of her produce.

(*c*) The further opening of several of the new countries should afford increasing outlets for Indian manufactured goods.

(*d*) If, in the course of time, agricultural research is developed in these tropical countries, the experience and results then attained should be of advantage to India, as the results and experience attained in India should be of advantage to those countries.

Domestic Trade.

Great as is the importance of India's overseas trade in surplus agricultural produce (and it is almost impossible to exaggerate the importance of that trade to India), yet the chief market for Indian agricultural produce is the home one. It is sound business for a country to export its best (the "best" can bear the fixed charges of freight, commissions, &c., more easily) and consume locally that which is not so good, yet for many commodities the home market is almost the only, or certainly the preponderant one, e.g., rice, the millets, fruit, vegetables, milk, poultry, eggs, &c. A farmer stands to gain increased returns for his efforts and inevitable expenditure mainly in two ways.

(i) From increased yields;

(ii) from better prices for quality, as and when delivered to the consumer. It is not enough that the quality at the time of production on the farm is superior; it has to be recognisable as superior at the time of ultimate sale for consumption.

It is also a truism in regard to agricultural produce that the primary producer is the man who ultimately bears the loss arising from waste and deterioration between the time of production and of ultimate sale.

Many markets are under Health regulations, but I am not aware of consistent efforts being made to improve the return to the agriculturist by encouraging better methods of preparing, packing, grading, transporting of farm produce to the markets and of selling it there. That is the work really of an agricultural department, not of the co-operative department. Where co-operative sale—one of the most difficult of all things to establish —is possible, the co-operative department may, and probably should, take over the work connected with it, but my point is that the improvement of the methods of preparing for market, *transporting and of marketing of agricultural produce* is, and should be, the concern of the agricultural department. Problems connected therewith need careful local investigation in each case (for hasty deductions are frequently wrong) to determine what is necessary, and then what is possible. It is not a question of studying agricultural economics, which generally means dissertations on taxes, rents and yields; it is a question of understanding the methods and details of ordinary day to day trade and of realising where waste and loss occurs and how it can be met.

It may be that agricultural departments are giving regular attention to marketing in the domestic trade, but that was not the case in my time, and my contention is that this duty should be recognised as one of the most important functions of an agricultural department. An agricultural department which is only in touch with the farmer, and not with the trade and traders in agricultural produce (whether for foreign or domestic markets), is only half equipped. The Royal Commission ask for illustrations from witnesses' own experiences. My experience is largely out of date. But when I left Madras we were engaged on such questions connected with potatoes from the Nilgiris, milk, ghee, but we had had no real study of market methods and practices.

Very elaborate work is being done in England at present on this aspect of their agricultural problems (*vide* the reports on the Marketing of Agricultural Produce now being issued by the Ministry of Agriculture). I do not suggest that such work in the Provinces of India should be so elaborate, but work of that character well done often makes definite action possible not only to secure direct economic benefit to the farming community, but also to prevent much of the work on "quality" done by specialists, from being largely rendered useless. As an instance in India, of the last I would

cite the trade and legislative measures taken as a result of the enquiry by the Indian Cotton Committee.

The reputation of Indian Produce on the London market and suggestions for improvement.

The general tendency of modern trade is to insist on higher standards of purity, uniformity and condition. Several Indian products, e.g., wheat, barley, have been improved in recent years by trade action. The adoption of definite trade standards is the most potent and satisfactory method of ensuring improvements. It is, in my opinion, the only one possible in regard to many crops in India. I mistrust the general practicability or advisability of official export certificates especially for quality. What is required is to encourage or assist the formation of trade organisations sufficiently strong and united to insist on standards.

Indian produce has often very rightly had a bad name on the London market but in several cases very considerable improvements have been effected; but the probability of increased competition to which I have alluded above makes the observance of high standards of quality all the more necessary by India. I have not recently been in the City, but I should expect that the Indian commodities which are to-day most open to criticism on these points are hemp, hides and skins, groundnuts. In each case the first need is to get at the facts, as is now being done with groundnuts. Thereafter if the case is established two courses are possible.

(i) for the Trade Association, if it can, to insist on a standard which is possible of achievement yet avoids the main disclosed defect; or

(ii) for some exporting firm to endeavour to put on the market a better uniform article and try to secure a higher price and so establish a brand or grade.

In the former case agricultural departments can help by letting farmers know the specifications required and how to obtain them; in the latter case, sometimes, by helping the firm to know where to try to get the produce of the required standard.

The Indian Trade Commissioner's Office in London

This office is undoubtedly under strength for its purpose. Close touch with the trade in London and England had been established when the establishment was cut down drastically owing to the need of retrenchment and for the same reason the office of the Trade Commissioner was moved from the City to Victoria. These two results have unavoidably weakened the connection with trading interests, which to be of real avail should be continuous.

Another fact which has hampered the work originally started has arisen from the great increase in the number of Committees dealing with economic questions which have been formed since the War. The High Commissioner for India has to be represented on many of these—it is not to India's interest for him to stand out—and much work falls largely on the Trade Commissioner.

I do not think the whole office needs reorganising so much as the Trade Commissioner needs more assistance and that this office be moved nearer to the City. The last will be done with the completion of India House, for (1) with a proper India House I consider it inadvisable to give the Trade Commissioner a different habitation and (2) I do not see how he could be moved at present from the High Commissioner's Office without giving the High Commissioner an assistant of similar type in his place, which would lead to confusion as the Trade Commissioner should be in

touch with much of the committee work in progress and the Trade Commissioner should be the High Commissioner's chief adviser on economic and trade questions. My recommendation is to push on with India House and then give the Trade Commissioner assistance from India.

I am not in favour of an Indian Trade Council. It is only another committee.

INDIAN TRADE COMMISSIONERS IN OTHER COUNTRIES.

I believe they would be useful and become increasingly so as Indian produce experiences increasing competition, provided that they are sent to selected countries and have had previous training with the Indian Trade Commissioner or experiences in London. This, at present, I can only see possible after India House is opened. Indian produce, in its wide range, qualities, defects, is best known in London. Also London is the best centre in which to become familiar with the methods and conditions of trade therein. Without the knowledge and experience which can be so obtained the Trade Commissioner abroad would be liable to make more than the usual number of mistakes and would not so well know what to look out for. The two centres I should be inclined to suggest are:—

(i) Southern France and Northern Italy.

(ii) Germany.

ADMINISTRATION.

Agriculture is a provincial subject and I do not suggest for a moment that it should be made a Central one. Great sides of its work are purely local in character and must be adapted to local conditions. But it is not so local in its character, as for instance is education.

Crops and trade ignore provincial boundaries, and though Madras and Bombay may be very important in themselves and in India yet outside India they are just parts of India, and the reputation of their produce is the reputation of Indian produce.

2. Again work on some particular crops can be most effectively done as the result of joint effort by all the departments in India—a case in point is cotton.

Or it may be that no progress can be made with a problem in one part of India unless work is done in another, for example, the breeding of new canes suitable for Northern India. In all such cases a Central Department is required to take the lead and give coherence and continuity to the effort.

3. An extension of the last case of co-operative work between different departments is where it is desirable to try to get part of a problem studied in another country. Here I would refer to the report on Research at the Imperial Conference of 1926 and to the proposal to develop a "chain" of research stations throughout the tropics. The question will, I understand, be further discussed at the forthcoming Imperial Agricultural Conference.

4. There is always the danger in Provincialising research that the research worker there becomes isolated and in some cases it may result in his devoting his attention to very minor questions and falling behind the progress of world thought. I would draw attention to the report of Lord Lovat's Committee of 1926 on the Agricultural Departments in the African Colonies and to the resolution passed at the Colonial Conference last month advocating the interchange and almost amalgamation of parts of the Agricultural Services of the African Colonies.

5. I do not question the Provinces in India keeping control of their agricultural departments, but the fact that they as parts of one whole—India—should facilitate and not retard their co-ordinating much of their agricultural efforts, especially in research.

Sir David Chadwick.

6. An agricultural staff—consisting of an Agricultural Adviser and research workers—under the Central Government is needed—

(*a*) to take the lead in cases such as those indicated in paragraph 2 above;

(*b*) to facilitate co-operation abroad, if any scheme is worked out, as may possibly result from the references given in paragraph 3 above;

(*c*) to facilitate co-operative work in the Provinces and be in touch with that work, as suggested in paragraph 5 above.

7. It ought not be impossible to secure a large measure of co-ordinated effort between the Provinces and the Central Department without impairing ultimate Provincial control. I do not know to what extent periodical meetings of officers in the Provinces and Pusa engaged on the same branch of research are continued, but in my opinion they should be encouraged with the Agricultural Adviser present or in the chair. The work in progress or to be undertaken in the Provinces and by the Central Department should be freely discussed. There should be no timidity either on the part of the Provincial representatives or on the part of the officers of the Central Department in suggesting schemes of work to be undertaken by the Central officers or to be undertaken by the Provincial officers. If, as a result of the Imperial Agricultural Conference, some machinery is devised for ensuring closer contact in agricultural research work throughout the Empire than occasionally leading men engaged in the particular science and familiar with the work in progress elsewhere should be invited to attend and assist in the consideration of work in progress and in contemplation. In carrying out a piece of research work the possibility of securing the co-operation of other departments, e.g., Forest, Medical and of outside bodies, e.g., the Universities or countries outside India should always be considered. The work allotted to the Central Department should as far as possible be of more than significance to one Province.

8. I have not had the time nor facilities here to work the question out, but I suggest the annual allotment of a fixed sum by the Government of India in which balances at the end of the year are not returnable or that a fund should be established from which

(*a*) would be met contributions to Imperial Organisations the maintenance of which is helpful to research generally throughout the Empire, e.g., Imperial Bureaux like those of Entomology, Mycology, &c.

(*b*) would be met expenses incurred in securing aid in investigating particular problems, whether

(i) from abroad,

(ii) from Universities or private institutes,

(iii) by engaging for a period special scientists.

The Secretary to the Government of India in the Department should be Chairman of the Committee allocating allotments from the fund.

This should be supplementary to work undertaken at the Central Research Institute by the regular officers of the Central Government.

Oral Evidence.

55,739. *The Chairman*: Sir David Chadwick, you are at present secretary of the Imperial Economic Committee and in the past you have held the appointments of Indian Trade Commissioner in London from 1917 to 1922 and Secretary of the Commerce Department, Government of India, from 1922 to 1926?—That is correct.

55,740. We have your note of evidence: is there anything you would like to add to that in the way of a statement at this stage?—It is so long since I was in direct touch with the work of the agricultural departments that I have avoided details about their organisation. The points I wish to bring out with regard to general matters are two or three. I want to emphasise the danger of the agricultural departments becoming isolated in their work, the desirability of keeping connection between them and the Central Department, and, still more, with the work that is being done or may be done in other countries overseas. I have suggested, and probably the Commission have already had the suggestion put before them, that similar difficulties in administration have been occurring in other countries with federal or semi-federal Governments, as, for instance, in Australia, where they are still endeavouring to work out a system of bringing the agricultural departments more together and more in touch with some central organisation, so as to get some "team" work and direction in the research work that ought to be done. I know research workers from experience. The men I had with me did their work well, but they naturally object to control, and are afraid of it. I do not think control in the ordinary executive and administrative senses is desirable in regard to research workers, but I do believe they need some outside influence to be brought to bear on them in reference to the problems which they tackle. I do not believe in leaving them entirely to their own devices.

55,741. I think the Commission will be interested to hear, quite shortly, what is the scope of the work of the Imperial Economic Committee; we have not had direct evidence upon that?—I joined it last March. The Committee itself is peculiar; it shares with the Imperial Shipping Committee the distinction of having a regular constitution upon which all the Governments of the Empire are represented in a fixed proportion. The United Kingdom has four members; every other Government has two. The two committees in their respective spheres—shipping and economic questions—are appointed to consider economic questions of interest to the Empire as a whole. It is perfectly clear that at present no Government would give to such committees which have a fixed Constitution and so far have been continued, one for six years, the other for four, the consideration of questions of high policy. The Shipping Committee deals with shipping questions; the Economic Committee has been charged with the function of enquiring largely matters in relation to production, marketing and preparations for market, first of all into food stuffs with a view to their greater sale in the United Kingdom in competition with foreign goods. But in their enquiry, of course, the Committee consider the British producers as standing on a perfectly equal basis with any Dominion or overseas producer. They make their recommendations to all Governments of the Empire and not to any Department of the Home Government. Being an Imperial Committee, they quite rightly have not, and cannot have, any executive functions in carrying out such recommendations; those functions must be left to each Government. In Great Britain the Government have established the Empire Marketing Board to give effect to such of those recommendations of the Committee and others, which it considers desirable, and to carry out similar work which, in the course of carrying out its early work, it finds desirable.

55,742. So that you have no funds as a Committee?—We have no funds as a Committee for executive work.

55,743. Do you make recommendations to the Empire Marketing Board?—No, we address our report to the eight Prime Ministers of the Empire, to the Secretary of State for India and to the Secretary of State for the Crown Colonies. It is left to those administrations to take any action

on those reports that they see fit. In the past, certain of the recommendations have been directed towards advising the provision of funds for research on particular economic questions of importance for the trade in that commodity.

55,744. The Commission had the advantage of hearing evidence from Mr. Lindsay, the present Trade Commissioner in London, a few days ago. There are one or two points relative to the organisation under Mr. Lindsay which I should like to ask you about. It has been suggested in some quarters that an advisory body consisting of merchants and traders interested in Indian produce in London or other towns in Great Britain, might be formed with a view to advising the Trade Commissioner on technical trade points. Have you any views as to the usefulness, or the reverse, of such a body?—I really cannot see of what use such a body would be from my own experience.

55,745. You find no difficulty in obtaining detailed information on technical subjects touching various lines of Indian produce, the requirements of the markets, and matters of that sort?—Practically none; I think I was able to obtain more by direct contact and seeing those engaged in the trade and industry, than I could have obtained from any committee. I found all the merchants in all the trades extremely ready to see me and very helpful. Of course one learns as one goes on, and I found, as a matter of fact, that I could never, so to speak, give them sixpennyworth of information which was useful to them, without deriving from them about a shilling's worth which came in useful to me later on.

55,746. Is it the case that it is, in the main, the firms of lesser standing who come to the Trade Commissioner for information? Bigger firms have already so many channels of communication and knowledge, that they do not require his assistance?—That is quite true, especially as far as the bigger firms are concerned, in regard to the trade in which they have already been at work for a long time; they necessarily know more about that than the Trade Commissioner himself; but what I did experience was that the larger firms do not maintain libraries in London, of reference books on India and other matters; if they receive a recommendation or proposition from their Indian offices to branch out into another line, they are as anxious as anybody else to obtain information regarding it. If they find an office in which some of that information is readily available, they soon learn to use it. That is exactly the point.

55,747. You give it as your opinion that ultimately it may be necessary to initiate other offices in different parts of Europe in order to cope with the work?—Yes; I do not think there is need for it at present, and it is a case of development; you have got to pick your men and train them. I have mentioned Southern France, Northern Italy, and Germany. I mentioned those three for these reasons: at present the trade with the United States is mostly in jute; which is the most established of our trades, and as you have heard, there is a trade with the United States to a certain extent in tea. There are also skins in Southern France and Northern Italy. India has more diverse trade connections: hides, oilseeds, and cotton. Also in these markets, especially in oilseeds, there is considerable competition to be met from the West African Colonies and from West Africa generally. Germany has also a rather diverse trade with India.

55,748. Do you wish the Commission to understand that it is your view that, for the present, the Trade Commissioner in London is able adequately to look after the interests of Indian trade all over Europe?—No, I consider that the Trade Commissioner in London is at present considerably under-staffed. Although I have been Trade Commissioner

myself, it was unfortunately my lot as Secretary of the Commerce Department, on account of retrenchment, to cut his staff down; but he is understaffed. What I do think is that it would be unwise to send men out to a distance either in Germany or in Southern France, until you have been able to give them a training in London, where, after all, I have found a man can pick up his trade information, in the commercial sense, much more rapidly than in any other centre.

55,749. When you were Trade Commissioner were you responsible for Indian trade interests in America?—No; as I said before, we had left America largely out of the question; we could not go there. I am speaking from memory, but I do not think our trade with America is at present very diverse.

55,750. Have you formed any view as to whether an organisation might be set up in America to do the work there that the Trade Commissioner is doing in Europe?—No, I have not examined the American position very carefully. The Trade Commissioner performs two functions; one is helping trade generally, the other is sending information back, which is quite as important, both to the Government and to trade associations in the Provinces in India. At the same time, a full day's work for a man is necessary; otherwise he gets lazy. There may be under the second head, as our trade develops, enough work for him, but I have not examined the matter in detail.

55,751. I see from your note of evidence that you are quite definite in your view that the Trade Commissioner's office should be moved from Grosvenor Gardens as soon as there is a place for it in the new India House?—Yes, quite.

55,752. When do you think the new India House will be prepared to receive the Trade Commissioner?—That is the difficulty. There I must ask you to take evidence from the High Commissioner, but I am very glad to say that I think the preliminary money has been voted and the idea has been accepted.

55,753. But you think, until India House is ready, it is necessary to house the Indian Trade Commissioner in Grosvenor Gardens, so as to be conveniently placed for the High Commissioner; is that the idea?—Yes, that is the difficulty. I do not say it is essential, because I dare say with a little care and thought and good will, it could be got over, but undoubtedly the committee work, which falls to a High Commissioner's office, has developed in an extraordinary way in the last few years. It may be reduced; the High Commissioner has many interests; he is a busy man; he is bound to use somebody on his economic staff to do a good deal of that work for him. The Trade Commissioner ought to be in touch with it; he might perhaps be given another senior assistant to do that, but I do not want to bring about a divorce between this sort of semi-Government committee work, done by a Trade Commissioner, which has its great utility, and the trade portion in the City as if they were two distinct things.

55,754. On page 401 of your note, under the head "Foreign Trade," you suggest that the trend of India's exports into Great Britain between 1911 and 1925, as compared with the trend in the total value of imports into the United Kingdom, suggests that India has not had her full share of the increase in business?—Perhaps so. What I do believe is that India must expect greater competition from the other tropical portions of the world. I think, in the past, trade has been too easy for India, and I do not think extra competition will do her any harm.

55,755. In 1911, the imports into Great Britain from India were £39,000,000 sterling; in 1925, £66,600,000; the imports from the Crown Colonies and Mandated Territories in 1911 were £24,800,000 sterling, and £78,400,000 in 1925?—Yes.

55,756. Is it your view that those figures are any warning to India?—I think they do carry a warning; they must not be pressed too closely as proportions; I do not want anything like that to be done with them, for the simple reason that one ought to remember that India, in these commodities, has an enormous direct trade with other portions of the world to an extent to which the Crown Colonies have not developed, as yet, direct trade; so that I do not say they have cut into India's markets in the whole world to that extent, but I certainly think those figures constitute a warning.

55,757. What is your experience, speaking very broadly, of the reputation of Indian goods on the European market? Is the word "Indian" a good word in European markets?—No, though its credit is improving. It has got a long history behind it, and old opinions cling round words, even when the justification for them is decreasing. A good many of India's commodities in the past have not had a good reputation.

55,758. Mainly because of the unevenness of the produce?—Mainly because of the unevenness of the produce, and originally, though it is lessening, on account of the quantity of dirt which used to come over with the produce. I do not say that that dirt was added entirely deliberately; a lot of it was due to pure carelessness and the sandy conditions in India. For instance, that was one of the big difficulties with wheat, and a very big difficulty at one time with regard to indigo, before the artificial indigo came in.

55,759. So that you attach very great importance to better cleaning, grading and packing of Indian produce?—Yes, in the broadest way.

55,760. But at the same time, again speaking in a very broad way, you are not attracted by the suggestion of enforcing any particular standards at the ports of export in India?—I have often tried to think that out on the administrative side, and I find this extraordinarily difficult to apply. There is one instance in which it is being to some extent done in India recently; that is with regard to coal under the Coal Act of a year or two ago. By that Act there is very careful restriction that the certificates only apply to a statement of fact, viz., that the coal comes from a particular colliery, or a particular seam in a colliery which has a certain accepted analysis; the certificate does not say what that coal is, it only says whence it came. If there was a majority demand among the producers in a trade, for Government assistance in that way, I should not suggest that Government should sternly refuse; but I cannot see that Government could usefully lay down administrative standards for quality without the good will of the bulk of the producers. They are on safer ground when the tests to be applied relate to easily ascertainable facts; e.g., in grading of eggs or actual presence of dirt in some kinds of produce.

55,761. On page 405 of your note, in answer to Question 4 you say: "If, as a result of the Imperial Agricultural Conference, some machinery is devised for insuring closer contact in agricultural research work throughout the Empire, then occasionally leading men engaged in the particular science, and familiar with the work in progress elsewhere should be invited to attend and assist in the consideration of work in progress and in contemplation." Your suggestion there is that experts from outside India might be called into conference?—Yes, the idea that was in my mind was that those at work in different branches of the agricultural sciences in India should get together and review what lines of work they were contemplating, and it would be a very useful thing if on those occasions, not every time, but from time to time, men at work on a similar science from abroad were also brought in, and one or two of them given a share in the deliberations. It is a difficult problem, but my idea is to try and avoid the possibility of the workers in India being isolated.

55,762. You have not worked the scheme out in any detail?—I have not worked the scheme out in any very great detail, but I do not think it is impossible.

55,763. The condition most likely to bring about visits from distinguished research workers in the field of agriculture in other countries to India, would be that the research workers in India should be of the highest calibre themselves?—Undoubtedly; and that is one of my points in inviting the men out to attend in that manner. One of the complaints of research workers in scattered portions of the Empire, is that they do not always receive the recognition they desire. I am now speaking of recognition in the scientific sense. I think they receive stimulus by such visits.

55,764. *Sir James MacKenna*: Your idea, in suggesting a central fund administered by the Government of India, is that it should meet the cases which you envisage, where an outside worker of distinction is brought in to work out a particular problem?—Yes.

55,765. Other matters, like the sugarcane work, you would keep under central control? What is your view of the sugarcane work which was done in your own Province, in Madras?—May I take the first question first. It was to try and get some elasticity in the taking up of problems for research. It is not an easy matter, as you know, to have to justify to a central administrations expenditure upon each particular and different problem. At the same time, you need selection from amongst the probable problems that can be taken up for investigation; I mean selection as to which are the more important and which should be adopted. By the limitation of their finance, you impose upon those who are already interested in these problems the need of making the selection. If you do not put on some limitation, they will want to investigate every possible problem. I can cite an experience, similar to some extent, of the Empire Marketing Board. It has the funds that it is prepared to give for a certain class of research problems. It meets either the Medical Research Council, or the Agricultural Departments, or Universities, and works out a sort of scheme of territory, distributing the work out; but each proposal has not got to go to the Treasury for complete sanction, and the limitation on its funds causes it to be very selective of the schemes it takes up.

55,766. At present, with the organisation of the India Central Cotton Committee, certain aspects of research there may be said to be controlled. Sugarcane breeding is also now under control, that is to say, the work at Coimbatore?—Yes.

55,767. Another matter with which the Central Department is dealing is dairying: do you think that is a subject for central direction, or should it be left to the Provinces?—*Qua* dairying, I can see very little difference between it and the improvement of a rice crop; on bed rock principles, dairying I should have put down as a provincial subject. You have got the difficulties that it requires a tremendous amount of finance, it is an expensive business, and there may be other reasons based upon its history and old associations with the military farms, which may lead it to be regarded as a central problem. In its essential principle I should have thought it was primarily, as there is no export trade in it, a provincial question, but I should have liked to have seen it tackled co-operatively by the Provinces. There is a fundamental research which is being done on it in this country. I do not see that that same work should be attempted in India, but discoveries may be made here which may be of the utmost importance to India. For instance, there is no question of being able to fortify ground nut and vegetable oils for margarine with vitamins, so as to make the margarine absolutely as good a food as butter. That is a very important question. If anybody tackled that question, or similar questions in India, that would be what I should call fundamental research, which would be primarily for a central authority, and not for a Province. I should use my fund in such

ease, so as to have the power to put some of the work out and probably get it done by men in England; at any rate to get it done where it can best be done.

55,768. Then there are the questions of animal nutrition?—The fundamental principles of animal nutrition I should regard as central; I should not attempt to copy the work that is being done somewhere else. I should endeavour to make a contribution and to combine with workers in Australia or England, to get the work paid for and done. It is extremely difficult to bring up each of such problems to a standing Finance Committee.

55,769. *Professor Gangulee*: Following up that last answer, broadly speaking you would ask the central organisation to pay more attention too all-India problems?—Certainly, that is the idea.

55,770. Problems which concern all the Provinces?—Yes, what are known, more or less, as fundamental problems. The central organisation, as far as possible, should look to the really fundamental questions; it should do work which is advantageous for the whole of India, also even, for instance, the compilation and exhaustive collections of samples, etc. in entomology and so on. Indian insect life is not a question of Provinces; a lot of the work is done in the Provinces, but that is a thing to be published by the central organisation. Similarly with regard to mycology. Again, the central department ought to be able to take a lead where an economic question is going to be tacked for India as a whole, as for instance, it did the cotton work.

55,771. You suggest that it ought not to be impossible to secure a large measure of co-ordinated effort between the Provinces and the central Government, without impairing ultimate provincial control?—Quite.

55,772. What organisation would you set up to bring about this measure of co-ordinated effort?—It depends upon the personality of your men, of the heads of your departments. I do not see what machinery you want.

55,773. Would you have a permanent organisation or would you just depend on the personnel of the Provinces?—No machinery and no extra organisation is required; you have got the heads of your various sections. I have not been in touch with the Provinces recently in these things, but I should still like to see them have practically the right to go round the Provinces and inspect the work and talk with the Minister about what is being done.

55,774. Just periodical meetings of Agricultural experts of the provinces; is that the idea?—Yes. It depends on the personality of your men; paper organisations will not do it. But if there is a man who will take a lead and do it, he should be encouraged to try.

55,775. You would not have any central organisation of any sort with the object of bringing various agricultural interests together?—I do not quite follow; you must have the central research organisation still there; you must have those men.

55,776. But if the Provinces do not wish to co-operate with the central organisation, what then?—Then I should be extremely sorry for Indian agriculture, Indian trade and Indian economics generally.

55,777. Are you aware of the conditions of Pusa at the present time?—I have not been to Pusa for many years.

55,778. On page 403 of your note, speaking of the improvements of marketing conditions, you say that that is the work really of the Agricultural Department and not of the Co-operative Department?—Quite.

55,779. Are you aware of the development of co-operative marketing organisations in India?—I have not seen its work very recently, but some of the marketing societies, that is the sale societies, have not done well. But I think I may not have my point clear: when you come to the actual

organisation and running of the sales society, if it is to be run co-operatively, that is the work of the co-operative society, and I think I say so in my note. My point is that the work of the Agricultural Department does not end with the improvement of agricultural practice and the improvement of the crop; it carries through to an examination of the way in which that produce ultimately reaches the consumer. The Agricultural Department may come with the recommendations to be made for others to carry out. I do not suggest that the Agricultural Department should take control of markets and selling for instance; it may be that some markets are badly built and badly organised; that is for the Municipality. But an Agricultural Department must know in detail how the farmer's crops are sold and be prepared to aid him or agitate for better methods.

55,780. You would ask the agricultural department to look to the questions of packing, grading and so on?—Yes.

55,781. And not to the co-operative departments even when they are sufficiently developed?—The Agricultural Department ought to know that, to be adequate to carry out its functions.

55,782. You know the agricultural departments in India; do you think they are adequately staffed to carry out that work?—They were not in my time; but, as I have said I have not been in direct touch with their staff and I do not know how many men they have now got; but I very much doubt if they are adequately staffed; I should be very much surprised if they were, and I should be rather surprised if the Commission have received very much detailed and sifted information in answer to Question 20. I do not know what you got in India.

55,783. *Mr. Calvert*: Have you in your mind any rough idea as to what percentage of the total produce of India appears in the overseas trade?—No, I should not like to say that off hand. You mean of the agricultural produce, not the mineral, of course.

55,784. The figures you give are of the total produce?—No, those are raw materials, food and tobacco. Of the agricultural produce it is only the surplus, as I have said again and again, which is exported.

55,785. For the sake of the argument which you have set forth here, would you accept a rough figure of something like two-thirds of the agricultural produce as being consumed, by the producer and of the remaining one-third, about twenty-two per cent., as being consumed in India, and the remainder going overseas?—Very possibly.

55,786. Actually it is somewhere about those figures?—I am quite prepared to accept the result of your investigations.

55,787. The main point is that the home trade is immensely more important than the overseas trade?—Yes, I agree; in many commodities, it preponderates; that is why I consider the Agricultural Department ought to be in touch with it and try to examine it.

55,788. Then I presume you agree that the main point in raising the standard of living of the people is to raise their standard of consumption? —I put it that a great point in raising the standard of living of the people is to increase their wants and thereby, their consumption; let them go to the cinema if they want; increase their wants and desires.

55,789. *Sir Henry Lawrence*: And their ability to satisfy them?—Then, in that way, you get the spur to satisfy them.

55,790. *Mr. Calvert*: And the fact that India imports such a considerable amount of treasure every year is an indication that she does not want to consume overseas commodities?—I would not accept that statement at all, if I may be allowed to say so. It is one of the characteristics of the last twenty years of Indian import trade that it has not only increased in quantity but extended still more in variety, which shows the growth in

the people of a more diversified demand for articles when they are brought to their knowledge and within their scope and they obtain sufficient economic power to buy them; I mean it is common knowledge to all of us: from the Singer sewing machine to the bicycle, the motor car, the gramophone, the cinema, and everything else.

55,791. You do not think the main reason for the import of treasure is because there is no demand for other commodities?—I should put it that the big demand for treasure is attributable to the preference of the prudent man in India to what he, by long tradition, believes to be one of the safest forms of investment for his nest egg. It is human to endeavour to save; it is not always possible to achieve it.

55,792. *Dr. Hyder*: Are not gold and silver commodities also?—Quite right, they are commodities.

55,793. *Mr. Calvert*: They do not usually appear in the figures of the balance of trade; they are reckoned separately. Is it your opinion that marketing is so important as to require really a separate expert branch of a department?—If I were Director of Agriculture at present in Madras and I could get the funds and so on, I should certainly develop a marketing section; I might not succeed in persuading those that supply the funds that it is necessary, but I should endeavour to do so.

55,794. You rather stress the point that marketing is an important function of an agricultural department?—Certainly.

55,795. It is very largely a question of how you define agriculture?—Certainly.

55,796. Your idea is that marketing and technical agriculture should be more or less under the one control?—Certainly.

55,797. You are not suggesting that marketing is the function of a botanist or a chemist?—Certainly not; but then I never imagined that an agricultural department consisted solely of botanists or chemists.

55,798. As a matter of fact, the Directors of Agriculture in the different Provinces are in many cases chemists?—I said I was not in touch with the more recent developments of the departments in India; I presume they were selected because they were the best men.

55,799. The main point is that more attention should be paid to marketing?—Undoubtedly.

55,800. Would you go so far as to press for some one whose sole duty would be the study of this problem?—I do not think you could do that regularly. If I were endeavouring to develop it in Madras: one learns to some extent by trial and error, what I should endeavour to do would be to get a really good assistant such as I already had on my agricultural staff, who had a tendency that way, to get to know and study markets and marketing generally. Then, when we come to a particular crop, I should probably get the agriculturist who is working on that crop to go into it in detail and let the member of my staff who is dealing with agriculture generally check him, check his results and advise him. But I do not believe in trying to divide up the Agricultural Department too much into watertight compartments.

55,801. It may be a question of relieving the Director or head of the Agricultural Department for work more immediately connected with agriculture?—May I give an instance from foreign trade? When I took over as Director of Agriculture in Madras, we had a good team in the department. Those who knew it at that time will say that we were at that time very fortunate. They got started on some of the most obvious problems and were doing extremely well on the pure agriculture side: selection of types, improved implements, &c. They were almost entirely out of touch with the trading interests and economic side. The farmer was getting no more for producing the better quality article, unless also he was getting a better yield. That made it my special function to

endeavour, as Director, to do that work myself, to try to get into touch with foreign trade. It was purely on account of that that I have got diverted from agriculture to commerce, as it turned out. Having got that, I am certain I was able to help my men by giving more direction to their efforts and in getting for them the very close sympathy of important trading communities, but that merely touched the fringe.

55,802. Looking back on your connection with India, do you think that this, roughly, eleven per cent. of produce which goes overseas, is not really distracting attention from the eighty-eight per cent. which is consumed internally?—No; what I say is that, for an agricultural department, it was the natural thing for them to set to work first of all upon that eleven per cent. It is not India alone; but wherever you have got an export trade it means you have trade going through organised channels and it is then easier to find out what are the requirements of that trade: it is thus always easier to tackle an exported commodity in the first instance than it is to tackle a home commodity. Take the export of chickens from France to this country; you have exactly the same thing. But now I think they ought, in India, to get on to the home work, to the crops which have big domestic importance. They would be leaving out of consideration the greater bulk of the agricultural produce of India if they concentrated solely on the export crops, of that I am certain.

55,803. You still adhere to your opinion that it is almost impossible to exaggerate the importance of the eleven per cent. even to the neglect of the eighty-eight per cent?—I do not agree we have neglected the eighty-eight per cent. I did not quite follow your point.

Sir Henry Lawrence: I understood Sir David to say that was the best thing to take up first.

Mr. Calvert: He says "it is impossible to exaggerate it," and my point is that the fascination of overseas trade has misled the Government of India and is mostly responsible for the neglect of agriculture.

55,804. *Dr. Hyder*: Is not it a fact that the work which is done on the eleven per cent. trade also comes to the advantage of eighty-eight per cent.?—In certain commodities, yes.

55,805. Take rice?—Yes, and cotton. I see you are on that first sentence under the heading "Domestic Trade." I am quite prepared to be criticised upon its wording in which I say it is almost impossible to exaggerate the importance of one thing, and then in the next line I go on to say the other thing is the chief one. I am quite prepared to agree that it is not happily worded grammatically.

55,806. *Mr. Calvert*: Taking the actual constitution of the Government of India and of the Provinces, do not you think far more importance is being given to the small proportion of produce which goes into overseas trade?—Yes, that is what I said to begin with, and it is natural.

55,807. The Government of India is devoting more attention to the overseas trade than to internal agriculture?—Do you mean the Government of India as distinct from that of the Provinces?

55,808. Governments in India?—I say the agricultural departments have been, yes. I do not know why you say "Governments." The agricultural departments, yes.

55,809. Governments in India have been devoting more attention to the overseas trade than to the agricultural departments?—I do not think so. The Governments really do very little actually in overseas trade; they do practically nothing to overseas trade but put on duties and take them off and keep a Trade Commissioner; that is about all they do in actual overseas trade.

55,810. *Mr. Kamat*: Is it within the province of the Trade Commissioner's duties to assist firms in India if they wish to send suitable students here to learn manufacturing processes, to help them to get admission to factories here?—No, I believe that is with the Students' Department of the High Commission, i.e., under another branch.

55,811. To your knowledge, does that branch help firms or students coming here to learn manufacturing processes?—I believe it has done a great deal. I think that aspect has already been enquired into by Lord Lytton's Committee, and it is also for the High Commissioner to say. Of course, the Trade Commissioner exists primarily for the export of Indian produce: he does not exist for the export of British goods. Therefore he gets into touch more with the manufacturers who use Indian produce; those are the men he is more in touch with rather than with the manufacturer of steel and engineering goods who is exporting the goods to India, and it is this last class of manufacturers from whom the student wants to get his teaching, as a rule.

55,812. At the present stage in India, at any rate, big firms do know where to export and what to export and very little assistance is necessary from the Trade Commissioner so far as export is concerned; the real assistance necessary now, at the present stage, is with regard to the second process: to convert their raw goods into some manufactured article?—I can only recall my own experience; that is that when they appointed me Trade Commissioner in the City of London I was not at all happy, because I could not see that I was going to get anything to do whatever or be of any use to anybody; it seemed to me there were these big firms with their connections with India, staffed in London by men who had served in India, on one side; there was the India Office, with its libraries and publications, on the other side, of an extent and more complete than I could ever collect together. But before I left, people seemed to think a Trade Commissioner had been of use. As I said, the firms often had not the information outside their own experience; the India Office libraries, etc., are quite rightly not organised with the direct objective of giving commercial information quickly. Of course, as I said before, the firm had the information of its own particular lines of experience, but did not always know where to look for information if it wanted to go a little further out.

55,813. The chief thing India wants is to turn its raw material into finished articles, and for that purpose they want to send their boys to England to be taught these processes?—I think you will find that the High Commissioner's Office tries to do all it can in that way. You must remember that firms, and especially big firms, if they take a young man on are taking him on and training him in the hope that he will stay with them; very, very few actual commercial firms anywhere who are making their living by their commerce want to convert themselves into training institutions.

55,814. *Sir Henry Lawrence*: You have agreed that the internal consumption of the country is the greatest concern of the Indian agriculturist?—It is the biggest market for his produce; it is the most difficult thing to tackle.

55,815. You accept those figures which indicate that the internal consumption is about ten times the external trade?—Yes.

55,816. You agree that the improvement of that market for the agricultural products would lie chiefly with the prosperity of the consumer?—Certainly.

55,817. That is, the local consumer in India?—Primarily, yes, and, secondly, with avoidance of waste which I am pretty certain would be found to be going on under present circumstances, in many cases: i.e., waste in between the producer and the ultimate consumer, owing to deficient grading, carelessness, handling, delay, &c., &c. Waste in the handling of

all these primary products ultimately comes back on to the man who grows them.

55,818. The prosperity of the consumer is necessarily one of the most important considerations for the improvement of the agricultural market?—Undoubtedly.

55,819. Taking the population of India quite broadly, out of some three hundred millions, some sixty millions are urban, industrial or commercial?—Quite.

55,820. Would you consider that the higher class of agricultural product is consumed more in the cities by the industrial and commercial classes than by the rest of the population in proportion?—By the higher class of agricultural produce, you mean the better quality?

55,821. Yes?—In all probability, yes. In any farming country anywhere, you get a certain amount of poorer produce; you cannot help it. It is real business to sell the better and eat the worse at home; it is not always done, but that is the business side of it. The best quality will tend to go the further: it can bear more cost of transport and it will go where the price is highest; therefore it should go to the towns.

55,822. You have heard complaints that village industries are not prospering under the present economic system?—Yes, certainly.

55,823. And that there is a considerable lack of employment amongst the commercial and industrial classes in India?—Yes.

55,824. Is there any machinery existing in India that observes the prosperity, the improvement or falling off of village industries, and the conditions of life of the urban industrial classes?—I think nothing more than what may be done by the provincial departments of industry or your Department of Labour in Bombay.

55,825. The provincial departments of industry are not yet very effective?—No, they are not, I agree with that, but I do not know of anything else.

55,826. The Indian Fiscal Commission issued a report about five years ago?—Yes.

55,827. You are no doubt acquainted with it?—Yes, I know it very well.

55,828. Do you think that sufficient action has been taken to carry out those recommendations?—Yes; I am bound to say that I

55,829. You set up a Tariff Board?—Yes.

55,830. A very good thing no doubt, but does that Tariff Board deal with any industries other than organised industries which are able to make out a case?—As far as the Tariff Board is concerned, when I left India we had got practically no applications pending with the Government which had not been referred to the Tariff Board, so that, to that extent, I must say, to which applications have been received it has met the demand.

55,831. But it is only from an organised industry that you can get an application; these small village industries which are not organised are not in a position to apply to the Tariff Board?—No, they are not.

55,832. So that there is no machinery to observe their decay or flourishing condition?—To watch their progress is left mainly with the provincial industrial departments; we have nothing in the Central Government to watch that.

55,833. The vast bulk of Indian exports consists of agricultural raw products?—Yes.

55,834. I would ask your attention to three particular industries in which the policy of the Government of India has not been entirely equal. Take the case of iron and steel. There, in some measure, protection has been applied?—Yes.

55,835. Now take tea. We have heard from the tea industry that, so far from being in any way encouraged, they are seriously hampered by restrictions in matters of recruitment of labour?—Yes, I daresay they are.

55,836. A third instance of some importance is sugar. I think probably that must have come before your department in particular. Now sugar is not protected?—No.

55,837. The Government of India have never agreed that sugar is a proper object of protection?—No. It has not had a full enquiry before the Tariff Board, and I doubt if the industry has applied for it. I cannot remember an application from the sugar industry for it; the duties on sugar though considerable do not come in the protective section of the tariff.

55,838. Those are three particular products of India, one mineral and the other two agricultural, in which India is able to deal with the raw product and put it on the market in a finished state?—Yes.

55,839. In regard to those three, in one case the Government of India gave protection, in the second they gave revenue duty but not protection, and in the third they definitely proposed hampering restrictions; is that a fair view of the policy of the Government of India?—Not of the policy; it may be a fair summary of the results; I will not say fair; it may be a very short summary of the results, but it is not a statement of the policy.

55,840. Because there has not been any definite policy applied to all three?—No, those results have arisen from very different considerations of policy. The results in regard to iron and steel flow from a definite attempt to protect an industry. The questions with regard to labour in the tea industry probably arose out of political or semi-political or other considerations. I am not familiar with the history of that. With regard to sugar, as I said, we have not had an application by the sugar industry for protection. The primary reason for the turn over from an *ad valorem* to a specific duty, which was very beneficial to the sugar industry, was one of revenue. It was done with the knowledge that it would probably help the sugar industry.

55,841. They say it saved it?—Yes, it saved it, and there is very little doubt that had the *ad valorem* duty been left and the change not made, an application by the sugar industry would have been made for protection, which would have been dealt with on its merits.

55,842. *Mr. Kamat*: Do you admit the statement that the tea industry has been hampered by the restrictions on labour?—They say so; I do not know anything about it; I never had anything to do with it.

55,843. *Sir Henry Lawrence*: Do you consider that the importations of foreign sugar into India affect the cane cultivator? Do they lower the price of gur and diminish his profits?—Theoretically they should and possibly they do. I expect the point is dealt with in the Sugar Committee's Report. It is very difficult to say off hand what is the result of the competition of one grade of article on another. Old and established customs and other matters of habit come in. I prefer to leave that to what the Sugar Committee found out by their investigation into the point, and I really do not remember what they did find. Theoretically, I should expect it to do so.

55,844. How long ago is it since the Sugar Committee's Report was issued?—1921.

55,845. Has there been any change in the conditions of the sugar trade since then?—Yes, the sugar trade went through a very bad slump, and latterly, thanks very much to the specific duty, it has got going again in Bihar and the North, and also it has profited very much by many of the better canes from Coimbatore.

55,846. *Sir Thomas Middleton*: You referred to the isolation of the agricultural worker in India; beyond arranging for conferences as frequently as may be and a free exchange of publications, is there anything that one can do to mitigate this?—It is a very difficult problem to mitigate it; I do not know to what extent the experts in the Government of India do visit the

Provinces now: whether they do it as freely as they did in the past; but I think it is desirable that they should. The only other thing I can suggest is for the Central Department to endeavour to keep in touch with any of the developments over here towards co-ordination; they have been tackling this question in Australia to some extent. The Director of their Scientific Industrial Research Board is in England at present; he arrived last week and I was talking to him on the subject yesterday.

55,847. Can you say whether the interchange of publications has been free in India?—I believe so. I do not know. How do you mean?

55,848. When you were directly connected with the departments, was there a free interchange of publications between the agricultural departments?—I think so, very.

55,849. What may have happened is that all of them received the publications of the United States of America, and get to know of each other's work through Washington?—You mean from Province to Province; oh, no, anything that was published was quite well known through India.

55,850. Through the Agricultural Journal?—Direct from Province to Province. Perhaps not our very local bulletins, but, speaking from memory, anything that was published from Coimbatore or any reports of the departments of Bombay, the Punjab and so on, were all on our list and were exchanged direct.

55,851. Do you know whether Indian departments were in close touch with departments at home who published similar information?—With many of them they were.

55,852. It was through personal contact; a man coming, say, from Cambridge would receive all the Cambridge publications?—There was a certain amount of exchange in which the provincial departments gained very much. as what they received was very often the better article; the vexed question was one of funds.

55,853. I was thinking of the exchanges between India and this country. As a matter of fact, we had no good system of effecting exchanges?—I think you will find the system of exchange has developed very considerably in the last twenty years.

55,854. The isolation you refer to need not have existed if there had been adequate means for promoting interchange of publications?—There I hardly agree; I do not think the exchange of publications is sufficient.

55,855. It may not be in itself sufficient?—I think you can exchange publications pretty nearly till Doomsday but nevertheless a research worker in a particular place may lose his initiative, get off on minor problems and go on in that way until he retires. He needs the stimulus of outside visits.

55,856. The isolated research worker is, in fact, anxious to secure records of experimental work, but he has often had a difficulty in getting them?—Yes.

55,857. *Dr. Hyder*: On the first page of your note you give the trade of India in the year 1911 as £39,000,000, and in 1925 as £66,600,000; then you go on and give the figures for the Crown Colonies for those two years. Are those two sets of figures comparable or have some millions to be deducted from the figures for 1925* in view of the fact that there were no Mandated Territories in 1911?—That is a fair criticism, but I only gave those figures as general indications, and I do not think the trade from the Mandated Territories at those dates was very large. After all, if you take Tanganyika, it was left, after the War, in a very disorganised state; its exports are only beginning to grow now. In 1924-25 what came

* The witness subsequently supplied figures showing that the value of Imports into the United Kingdom in 1925 from the Mandated Territories was £4,888,000. Against a deduction on this account must be set imports from these areas in 1911, the precise value of which cannot be stated.

from Irak I am very doubtful about. These exports were mostly from the Crown Colonies.

55,858. On the last page of your note, you suggest the allotment of a fixed sum by the Government of India for financial research whether carried on by the Imperial station or whether carried on at these different places you have mentioned. This is to come out of general revenue, is it not?—Certainly.

55,859. You have no idea of cesses, &c., for the improvement of particular crops?—No.

55,860. I take it that you would strengthen the central services in so far as they relate to agriculture under the Government of India, but you do not think of creating more posts under the Government of India?—You mean more branches of science?

65,861. Yes?—I should not think so at present; of course, as time goes on, you get some sciences splitting up. For instance, I do not know about biological chemistry, but I should not have thought so at present.

55,862. The proper thing would be for the Government of India to strengthen its Pusa organisation and then take part in the Imperial organisation; that is to say, the financing?—Financing or wherever they can help. Of course, it cannot be done at present, but ultimately I should like to see some of the work done at the Indian Universities and not have it all done by Government.

55,863. For co-ordination you would rely upon the men working under the central Government and the men working in the Provinces having frequent meetings?—Yes. It depends on the personality; I should like not only that the men should have frequent meetings but also that they should see the Ministers.

55,864. You would not like the central Government to encroach upon the present division of administration?—I do not think it is possible at the moment.

55,865. *Mr. Noyce*: What are your views on the possibility of financing agricultural development in India by export cesses?—I think it is perfectly legitimate where you have a large organised trade prepared to do it and the cesses are being devoted to a particular purpose; I do not believe in a general cess upon all agricultural produce for general agricultural purposes.

55,866. For agricultural development generally?—No.

55,867. Only for the purposes of the particular trade?—Yes, and then it ought to have the interests of that trade in view, and the bigger the export of that commodity the more its efficacy.

55,868. Obviously, the amount the Government of India can spend on Trade Commissioners for some time to come must be limited. Do not you think it would be better to have Trade Commissioners in East Africa or Mesopotamia than in Germany and Southern Europe?—We had one in East Africa, and there ought to be an increasing trade from India, especially in Indian manufactured goods, to both Irak and East Africa; it is growing and that trade will be mostly in manufactured goods; there ought to be an outlet in cotton and iron and steel. That being so, you have almost covered the articles in which that trade will be big, except perhaps sugar and rice. That is hardly going to give enough work for a Trade Commissioner, and I suggest that really the better way to tackle those questions is by deputations or visits from the trade. But I agree with you that it would be a great pity if the possibilities for an outlet of Indian manufactured goods in East Africa, and so on, were overlooked. But I do not think there is work for a Trade Commissioner twelve months in the year.

55,869. *Professor Gangulee*: You were familiar with the meetings of the Board of Agriculture in India?—From 1912 to 1916, yes.

55,870. Did those meetings serve to mitigate the isolated position of the research workers?—Yes, to a very considerable extent. They helped.

Sir James MacKenna and his assistants used to come and see us in Madras.

55,871. *Mr. Calvert*: Is it any part of your argument that it matters at all to the producer in India whether his produce is consumed in India or overseas, provided he gets the satisfactory price for it?—I do not think it matters a great deal where he sells it, as long as he gets the best price for it.

55,872. The overseas trade is merely a matter of getting a price?—Yes, and so is the home trade, if I may say so.

55,873. *Chairman*: So that, if a falling off in the demand for Indian produce overseas resulted in a serious fall in internal prices, by that much the producers of those particular money crops would be the worse off and their purchasing power and standard of living would go down?—Absolutely.

(*The witness withdrew.*)

The Right Hon. W. G. A. ORMSBY GORE, Under Secretary of State for the Colonies.

Oral Evidence.

55,874. *The Chairman*: Mr. Ormsby Gore, you are Under-Secretary of State for the Colonies. I think you have been applying your mind recently to the problems of agricultural research, to the organisation of research services, and you have also had the advantage of a tour round the Crown Colonies and the Mandated Territories, and so on?—Three tours.

55,875. Would you tell the Commission whether there are any proposals afoot for the formation of a permanent cadre of research officers?—Yes; we have felt for some time past that one of the main difficulties in regard to carrying forward fundamental research and even applied research in tropical agriculture has been the fact that we have been dealing with more than twenty different Governments. In the Colonial Empire we can leave out the areas outside the tropics as mainly small. The chief agricultural problems are in the large mainland territories of East and West Africa and the big areas such as Ceylon and Malaya in the Far East. One of our difficulties in getting the necessary research work done, and not only done locally but in such a manner that the work in one area will be of use to the work in another, and that it is not lost sight of but is followed up throughout the tropical Empire, has been the fact that, as I have said, we have been dealing with about twenty different Governments, and the scientific officers are in the service of each of those Governments and not in a common service for all. That is to say, they go in, become established officers with pension rights in a particular Government with its particular scale of salary and increments; the result is that transfer and exchange of personnel has been difficult and nearly all these agricultural departments have been apt to work in watertight compartments. This was brought up at the recent Colonial Office Conference that has only concluded a few weeks ago, and we there envisaged a wide project, namely, the creation of a single research service for the various branches of science. This is clearly not yet practicable, but we are now contemplating the creation of one service for what may be called the research officers of the agricultural departments: the men whose duties are not administrative but are investigatory: that is to say, the agricultural chemists, the economic botanists, the entomologists, and such additions as we have from time to time in the way of bio-chemists and the like. The four main elements in the staff required in dealing with tropical agriculture are of course, the soil scientist, the plant genetics, the insect and fungus problems. Our idea now is to try and form those into a single cadre, all entering at

the same basic rate of salary with local allowances adjusted to meet local conditions.

55,876. And all the positions pensionable?—No, we are proposing not to have any of them pensionable. We propose to have a separate provident fund contributed to by the Governments or by the pooled contributions of Governments. This seems the best way for working this scheme, because, apart from the question of transfers, we think a provident fund scheme is better than the permanent establishment with pension rights for people like research officers and scientific workers. We think that in order to attract the type of brain and the type of experience you want, you have got to have a fairly easy flow in and out, so that a man can realise that if he has done a good job of work in a Government department, say in West Africa, he has got a chance, without loss of rights, of going off, say, into private employment or working on his own. We think that is very important. It is different from the administrative staff.

55,877. Taking with him a reasonable sum on account of the money he has paid in?—Yes, it would be worked out on an actuarial basis like most of these provident fund schemes. The Empire Cotton Growing Corporation have got one for their scientific workers, and though our plan could not be probably quite identical with that, it would be more or less on those lines. Shall I go on describing this?

55,878. Please do. I think the point that interests us really is the extent to which this cadre, when it is formed, is likely to attract research workers and so to tighten the market?—By offering a career with fixed prospects in a service of wider scope than can be offered by any single Colonial Government, we hope to attract from the Universities all over the Empire more and better men to go in for agricultural research in one of its branches as a profession. I mean that if you go to any University now, and you say that in two or three years' time an Entomologist or a Mycologist will be wanted they may or may not have a man, and there is a risk. But if you can say that there is a cadre a couple of hundred men strong that has got continuously to be kept up, then the University authorities will realize that there is a bigger service and an assured career; and it will be easier for them to get the young men, and the young women too in some cases, on to work of this kind and begin training them for a career on those lines. So that I think we shall be the means, indirectly, of creating greater interest than already exists, and so a greater flow of candidates.

55,879. Is it possible for you to give us any indication as to the salaries you will be paying? Is that published yet?—No, that is not settled; a Committee was formed as a result of the recommendations of the Conference and they are considering such details. We realise that it has probably got to be something a little better than now, and we have got to make it clear that, just as in the administrative services, what is all important from the point of view of recruitment is to have a few well paid posts at the top to which all may think they are going to attain, though few actually do get there, similarly on the research side of our Colonial cadre, if we form it, we have got to have one or two well paid jobs at the top. There should be some plums in a service of this kind if we are really going to attract the enterprising youth of the country with the scientific mind.

55,880. Are you familiar with the College of Trinidad?—Yes, I have seen it in its early stages, and of course I have followed its growth and its difficulties. It is still a new institution, but I think the standard is steadily improving. Although it is only four years old, it is already proving of enormous value compared to anything we had before in giving a man who has been through an agricultural college in this country or

taken an agricultural degree say in Cambridge, contact with the Tropics and the wide outlook of tropical agriculture that he might miss if he were dumped straight into a job from a University in this country. It is mainly post-graduate at present; there are a few people who go there for the three years' diploma, but for the most part Trinidad is occupied now by the Colonial agricultural studentships. They go there for a year; they do a year at Oxford before they go to Trinidad; they get their degree either at Wye, Reading or Cambridge. They then do a year at Oxford at the expense of the Colonies who form the pool for this scheme, there being seventeen Colonies in it. They do crop statistics, and agricultural economics. After they have done a year at Trinidad, they are posted to different Colonies: Ceylon, Gold Coast, or whatever it is, from Trinidad. Not until they have got to Trinidad are they posted out. It is the Imperial College which at present feeds the Crown Colonies, Protectorates and Mandated Territories with the technical staff of the agricultural departments, administrative as well as specialist.

55,881. In these tours that you have recently undertaken have you studied the veterinary problems?—Very much so; it leaps to the eye. I am afraid, speaking only for the Colonies, one of the Cinderellas has hitherto been veterinary activity. When you go to a country like Northern Nigeria and you see a fine cattle country with probably about 4,000,000 cattle and an equivalent number of sheep and an equivalent number of goats, you see the tiny body of veterinary workers and the gigantic problems in front of them. You can also see how little investigation there has been into native types, the genetic side of it, the nutritive side, apart from the actual attack on the diseases that periodically come down and sweep off thousands of these animals. When you see that, you realise that we have done little to cope with the problem. Of course, we have only been in the country for twenty years: here again, it is the problem of getting the men. The man who is just an ordinary veterinary surgeon in this country, who may be able to deal with the well known diseases of horses and dogs, is no good in dealing with the difficult problem of the Fulani with their nomadic herds combined with Hausa cultivation, or when he is faced with the tsetse fly or other tropical diseases which he has never experienced before. We have not got, inside the Colonial Empire, anything like the amount of research and still less the amount of training facilities that are necessary to make the veterinary profession as highly scientific as it has got to be if the veterinary problems of the tropical Colonial Empire are to be properly faced and solved.

55,882. Is rinderpest a problem in most of these areas?—Very much so; it is almost the first problem that the small veterinary staff we have got has to tackle. In fact, until rinderpest is done with we do not get on to much else. We have had, I think, twelve veterinary officers in Uganda, and their first job was to deal and finish with rinderpest; they have just got this year practically to that stage, and now rinderpest is under control; it can always be resuscitated by the pig and the wild buffalo, but, in the main, we have overcome rinderpest, and the veterinary workers can now get on to the other urgent problems.

55,883. Has rinderpest been overcome by massed immunisation?—I know it, as a non-expert, more particularly by what they call double inoculation.

55,884. Serum-simultaneous inoculation?—Yes, the active virus with the non-active virus.

55,885. And that has been used on a large scale?—It has been used on a very large scale; we have produced large quantities of serum; we have had the building up of a native staff as well as the European staff for the administration of it.

The Right Hon. W. G. A. Ormsby Gore.

55,886. Where has the serum been prepared?—It is being prepared in the central laboratories in each territory. As a matter of fact, in Tanganyika, I think we have prepared a certain amount of serum for export, as well, to neighbouring territories.

55,887. Can you give the Commission any indication of the numbers of cattle inoculated in one of these areas?—I could get that for you, but I cannot give it out of my head.

55,888. Large numbers?—Yes, running into six figures in more than one territory.

55,889. Necessarily, or the result would not have been achieved?—Quite.

55,890. So far as you are aware, was the percentage of deaths not alarmingly high?—No, it was remarkably low. Of course, in certain parts of Africa there is a certain amount of immunity already in the cattle of the country; there have been periodic waves of rinderpest; it comes in great cycles, and there have been survivors in nature of those cycles which have carried on not only their immunity but very probably there is a certain hereditary immunity. I am touching on dangerous ground when I talk about hereditary immunity. The whole subject of immunology requires further research.

55,891. It suggests that the introduction of cattle from overseas and any attempt to improve the breed is not likely to be very successful?—Of course, that is being done in Kenya by the European settlers.

55,892. For milk mainly?—Yes, mainly with a view to the dairy industry; but elsewhere our general policy in regard to the native cattle is not to attempt to cross with exotic breeds, but to breed up. We have done all too little of it at present, from the best of the indigenous types.

55,893. Has there been any opposition by the native population to inoculation against rinderpest?—I do not think so; there was in the early days, but recently the whole population has got used to the idea of inoculation. They are themselves being inoculated for various things and they have seen the advantage of it on themselves and they have begun to think it is a good thing for the cattle too. The story of yaws, for example, in East Africa has gone into the remotest parts of the country: the amazing clearing up of yaws with the new bismuth inoculation. There is hardly a native in the whole 4,250,000 in the country who does not know that the white man's medicine consists in putting something into you with a needle and so clearing up human disease. The same is true of many other remedies. In West Africa they have a passion for N.A.B. for everything; if they come to a hospital a great many of the natives are not satisfied, whatever their ailment is, unless they have an intravenous injection of N.A.B. They are accustomed to the idea of inoculation for themselves, and it is not often that there has been much difficulty in inoculation of cattle.

55,894. I think the Imperial Institute in London is working out some of your problems in the technological field, is it not?—Yes. The Imperial Institute, in the main, helps us in two ways. It helps us more on the commercial side: that is to say, telling us what the value of a particular grade of tropical production is in the world market, where that market exists and where that market is extending. It also helps us by being able to place a Colonial Government or a Colonial Department of Agriculture into touch with the best authority, not necessarily itself, where the necessary scientific work that cannot be done on the spot could be done, if at all, either in this country, or elsewhere.

55,895. It is a post office?—Yes, mainly.

55,896. Is it the case that all recent experience suggest that, quite apart from the need for collecting scientific information, there is an

urgent need for its free dissemination in all directions?—Very much so, and it is one of the things that has come most to my notice in going round the Colonies, in what watertight compartments they do work and how little is exchanged.

55,897. The exchange of publications is not sufficient?—It depends where those publications go and whether they ever reach the destination that they should reach. I discovered that the Gold Coast was not getting the Pusa agricultural reports, but was getting the veterinary reports. The Gold Coast is a wonderful agricultural country but has very little veterinary work; there are very few cattle. I forget which Colony in the East Coast it was, but its major agricultural problem is connected with veterinary work; it was not getting the Pusa veterinary reports but was getting the Pusa agricultural reports.

55,898. Have you formed any view of the value of the Pusa agricultural bulletins and reports?—Yes, I certainly think all the specialised ones that I have seen are quite first class; those are really useful. I do not know whether the general reports are quite so valuable. The truth is that the exchange of publication is not enough; the only thing that is thoroughly satisfactory is the exchange of information and knowledge effected by the *ad hoc* bureaux, notably, the Bureau of Entomology and the Bureau of Mycology, where you do get a brief review of all the publications, and the workers can get, without wading through a mass of reports, a condensed vision of the work that is going on in their particular field. We want in agriculture a bulletin of the kind that is produced by the Imperial Bureau of Entomology in the other agricultural fields as well; I think that is the only way of solving the problem. The mere exchange of annual reports, and things of that sort, is not sufficient.

55,899. *Professor Gangulee*: We want something like the experimental reports published by the Federal Government of the United States?—Yes, they are useful; but the regular quarterly or monthly review of the work being done and the publications issued in a particular field is the thing that is of most value.

55,900. *The Chairman*: In your opinion is it the case that, at any active research centre, there are usually very important results not available to other research stations because they are awaiting the stage in which official publication is thought desirable, but which might most usefully be communicated privately to other research stations engaged on kindred work?—Certainly; I think where you have any important research station, without waiting for the final results of a particular investigation that may take three years to work out, it is up to the head of that research organisation to let the kindred or collateral research organisations know what his organisation is working at, so that there may be an exchange of opinion in regard to programmes as well as results.

55,901. My question was designed rather to discover whether you thought the early communication of actual results, before those results had reached a stage which justified publication, was advisable?—Yes, I agree; I certainly think more could be done in that direction than is being done. It is so difficult for me, as a layman, just to say how far it is being done and what the gaps are. All one can observe is that if you take a crop like cocoa which has been established for a very long time in a great many of these places: Trinidad has been doing work on cocoa, the Gold Coast has been doing work on cocoa, and Ceylon is doing work on cocoa; but I have never seen any reference in any of those three places to the work which is being done elsewhere. Trinidad, for instance, has certain conclusions in regard to cocoa, namely, that it is largely a problem of plant

genetics rather than a manurial problem or anything else. I cannot tell you whether that is the opinion of the agricultural people in the Gold Coast or Ceylon.

55,902. Do you judge, from conversation with these research workers, that they are in fact unaware of what is going on in these other centres?—Very often that is the case, yes. They get terribly isolated; they may keep in touch for a year or two when they start; but when they have been in a particular colony for any length of time it is extraordinary how quickly they do get out of touch. It is partly psychological, I think.

55,903. It is plain from what you tell the Commission that the research question in the Colonies and Mandated territories is receiving much attention, and it appears that the organisation is likely to be strengthened; would you regard it as of great importance that, just as there should be active touch between the various centres in the Colonies, there should also be touch between research workers in the Colonies and research workers in India?—I think that is vital, absolutely essential. After all, we are working very often on the same crops and very often on identical problems. Many of your problems, salting of soils, irrigation and all that sort of thing, are absolutely common to us. The problems of colloidal soil, laterite and all that are identical with us. Then there is the question of the increased loss of nitrogen under tropical conditions; all those things are absolutely common to our tropical Empire and India. We are both about the same area; we are both about 2,000,000 square miles, and again and again we overlap and there has not been sufficient contact, though I admit we have drawn on India for many of our best men.

55,904. *Professor Gangulee*: You have taken our best men: for instance, Dr. Leake?—We have taken many of your men; for instance, Mr. Faulkner, Director of Agriculture in Nigeria.

55,905. *The Chairman*: And now you are seeking to improve the bait?—We want to improve the base as well as the bait.

55,906. Following on your answers, do you think that some permanent body to ensure discussion and the interchange of information between persons working in various parts of the Empire, including the Colonies, might well be set up, or do you think there is some existing body which can meet that need?—I think we are still some way off a single body; the field is so wide and the branches are so many that one cannot imagine an omnium gathering apart from a conference such as is going to be held this autumn, the Imperial Conference, which is an admirable opportunity for people to meet and discuss things in general. A permanent body, especially a permanent directing body covering the whole field, is not yet, and I think will not be for some time, a practical proposition. I should like to see the extension of the bureau system. The various sciences dealing with agriculture and agricultural research should be covered in the same way as the entomological field is covered by the Imperial Entomological Bureau.

55,907. *Professor Gangulee*: That bureau is located in London?—When it comes to veterinary science, I am not at all sure that England is the right place for the central locus of that bureau. I do not believe in having a bureau of too elaborate organisation; I think these bureaux can be run comparatively cheaply, like the Bureau of Entomology; all you want is a small nucleus staff, with a man who knows the job and the science at the head of it, who is himself linked, and through his publications and correspondence is the link, with the progress in that field.

55,908. *Sir Thomas Middleton*: You want to follow the British model and not the American model of bureau?—That is right.

55,909. *The Chairman*: A first-class-man in the specialised subject spending his whole time on the business of collecting information and collating it?

—Yes, and sending it out and keeping the workers in touch with each other. We shall get a bureau of bio-chemistry I suppose one day; but the next two, it seems to me, are soil science and plant genetics.

55,910. *Sir Thomas Middleton*: Reference was made to the difficulty of getting veterinary officers; do you have scholarships for veterinary officers as you have for the others?—No, not yet. Our first committee is going to deal with the carrying out of the practical steps in regard to this research corps and its necessary headquarter organisation and finance; then we propose to go on to tackle the veterinary problem, as far as the Colonies are concerned, over the whole field: recruitment, training, study leave, and the whole veterinary problem. We are not quite ready for that, but we realise it has got to be done.

55,911. In speaking of the cadre of scientific workers, I think you said that it might be 200 or about that number?—Yes.

55,912. Have you gone into the probable number of the different types: chemists, botanists, mycologists and entomologists?—I do not know whether you have seen the paper I prepared for our Colonial Office Conference. There, in seventeen Colonies, we have got roughly a quarter of each. We have got ninety-one whole-time research workers; that is to say, people who have no administrative connection; some twenty-six of those are chemists, twenty-six entomologists, nineteen mycologists and eighteen plant geneticists, one soil bacteriologist and one micro-biologist. That is our existing cadre for those seventeen Colonies. It is not one service yet, of course.

55,913. And you have in mind the doubling of that service in the near future?—There is certainly the need and the opening for double the number of staff. At the moment there are not the men.

55,914. Your scholarships are parallel with the scholarships offered in this country, but I think the scholars are selected separately, are they not?—Yes.

55,915. Is there not something to be said for pooling the scholars at the selection stage so that you get a bigger pool? For example, the two Departments of Agriculture at present require six or eight scholars a year; the Department of Scientific and Industrial Research may offer as many as two hundred scholarships annually?—I think so.

55,916. I forget how many you offer; is it twenty a year?—About that: the number is increasing.

55,917. Instead of three selections from among candidates all of the same type, could we not have one selection?—That is a suggestion; it is the first time it has been brought to my mind and I cannot express a final opinion. Our system at the Colonial Office is purely selective; that is to say, we go for character and personality. We should be very loath to give up the system by which before any man is given a scholarship, his fitness from the point of view of personality and character for the work in a native tropical colony is carefully considered. That is the difficulty: you will get a man who is a first rate man at science, but who either by reason of physique or something of that kind, is not the sort of man who will be happy in a place, for example, like Nigeria or will succeed. That is the qualification that occurs to me in reference to your suggestion.

55,918. That is the sort of thing that could be taken into account by a joint selecting body?—Yes.

55,919. The bigger we make the chances of employment, the easier it will be to get candidates?—Quite true.

55,920. Even with your service of something like two hundred there will be great practical difficulties raised for the University teacher in advising his students; the wider you can make the objects for which the student works, the better the chance of a good list of candidates?—I agree; the

wider the source of supply the better, and the more we co-operate with the Universities and the colleges in improving that source the better.

55,921. Until quite recently the scholarships offered in Agriculture were the only ones of the kind?—I believe so.

55,922. Originally we used to select some twelve scholars a year?—I believe so.

55,923. In this country we could estimate pretty well what appointments would be open?—I believe that is the case.

55,924. But your difficulty, I think, will be much greater than ours in estimating?—Far greater; one way of estimating is the curve of the expansion of revenues. You can see the curve of the expansion of revenues in a place like the Gold Coast or Nigeria, and in those places it is a help to forecast.

55,925. Do you think you will be able to forecast the demand about four years ahead for agriculture?—I think we might be able to do that for what I call the research side; I am not sure whether we shall be able to do it for the agricultural administrative officers quite so easily.

55,926. Take a student of Cambridge who has passed his tripos; he has then to make up his mind whether he is going in for agriculture or not; it will take him two years to get his diploma?—Yes.

55,927. And there must be two years post-graduate training or possible three?—Not necessarily, in cases where the diploma has been taken.

55,928. So that he will want to know the prospects about four years ahead?—That is right; we should like to work to a four years' previous estimation. We have urged it on our Governors that previous estimation is all important, for example, in forestry, and some of them say they can do it. I think, if we press them enough, they will be able to do it in agriculture.

55,929. Your service is to be a graded service, just like the graded service we have for research workers in this country?—That is our idea.

55,930. You have not yet fixed the scale?—Not yet; we shall be going into that in the next few weeks.

55,931. What sort of work do you contemplate for the persons who are to have what you called the plums?—The heads of our central research establishments. If we continue we shall have a chain of centralised research stations: one, at any rate, in the West Indies, possibly on a side of Trinidad other than the training side; one in West Africa; one in East Africa; and one for the Far Eastern group of Colonies, and possibly one in the Middle East.

55,932. It will be directors' work?—Yes.

55,933. The difficulty is that when you make this the plum for the research worker and he becomes a Director, he does no more research, or very little?—Yes, that is so; he is organising other people's research; but that is a fine research job in itself, if one may say so.

59,934. Very often a man who is a very good research worker is poor at the other type of work?—Yes, that is true.

55,935. That is a very definite difficulty in organisation?—Yes, it is.

55,936. Have you thought of any scheme for relieving the Directors of research services of routine work? What has happened in practice in the existing research institutes is that the Director gets swamped with routine work?—Yes, I think he certainly ought to be more free than he is; one sees it already in such research institutions as we have at prescent. They are largely in an individual colony and are under the Director of Agriculture who merely sets the problem to his team at the central laboratory and central experimental station to work out, and he has administrative workers to do the routine, so that the research workers can carry on, having the administrative staff and the Director of Agriculture to do the routine work for

them. Directly we get to these central research stations like Amani, your problem will be right on top of us.

55,937. I was wondering whether you were considering the provision of a special salary for eminence in research? I have in mind people who are most valuable as research workers but quite impossible as Directors?—That is quite true.

55,938. They may be the most valuable research workers in many cases? —Yes. In the discussions at the Governors' Conference and the Sub-Committee the question came up as to whether we should have anything, to use a military term, like a "Passed Staff College," so that if a man had done a particular thing he could get some special letters after his name or something that would pick him out as showing he was a special research worker, and that should carry with it a certain higher emolument.

55,939. The provident scheme you referred to in connection with pensions is of the same type as the University scheme?—Exactly.

55,940. So that if a man resigned from one of these research institutes and went as a teacher to a University, he would carry his pension rights with him?—Yes.

55,941. You have given a good deal of attention to the question of the circulation of publications; I have seen some of your memoranda on the subject. You found, I think, that the position was really very bad in some Colonies?—I am afraid I did, in some cases.

55,942. Did you find that the men in our out-of-the-way Colonies were more in touch with American work than they were with the work at home? —Certainly; of course the Department of Agriculture at Washington broadcasts its publications a great deal more than we do, and the result is that a good many more people get access to them and get copies; that is an important factor. And undoubtedly the geographical factor comes in: in the West Indies they get more from America than from anybody else.

55,943. They can get many useful publications from Washington by asking for them?—Yes. I found a remarkable absence in all the Colonies I visited, with possibly few exceptions, of knowledge of the enormous amount of work that is being done by Buitenzorg in Java, though that institution and its derivatory institutions in Java have done such work on the very problems and work we are engaged on. Their publications have not been appreciated in the way I think they ought to be. The Dutch are extraordinarily good now in issuing a great deal of their stuff in English as well. There are a certain number of papers that are issued only in Dutch, but they do issue a great deal in English, and I always think that one of the functions of the bureau that I am so keen on should be to follow those publications; they should have somebody at the headquarters of the bureau to translate, I do not say the whole of them, but should abstract them.

55,944. Until the bureaux of mycology and entomology were set up our isolated Colonial workers had to depend almost entirely on the Journal of Agricultural Science for information on investigations made in this country? —Yes.

55,945. *Dr. Hyder*: How many students will you draft into your Colonial Agricultural Service every year? What is your estimate of your requirements for recruitment?—It is difficult to say; all one can say is that each year it is increasing. At the present moment, as I say, it is about twenty a year, and that is going to increase.

55,946. So that there will some available for other portions of the world? —Yes.

55,947. What is the value of this scholarship tenable at Trinidad?—It has recently been altered; I think it works out at round about £300 a year.

55,948. *Sir Thomas Middleton*: It was £250?—Yes, I think an additional £50 has been given for fees in the second year.

55,949. *Dr. Hyder*: You recruit these graduates who have taken a degree either in natural science or in agriculture at one of these institutes and send them for training at Trinidad?—Yes.

55,950. What is their age when you recruit them into your service, after two years' probation, one passed at Oxford and one at Trinidad?—I should say they are posted to their colonies not younger than 23: from 23, 24, 25.

55,951. You will entrust such a man with research work too, when he is of this age: 23, 24 or 25?—No, I admit I am rather mixing up the administrative agricultural officers with the research officers. The research officers may be a little older. When officers are first appointed of course they go first to the laboratory, to the headquarters, where they are still learning; and they may take part in a particular research under supervision. I call to mind the type of man I saw working on the production of this new cotton in Southern Nigeria, which is called Improved Ishan cotton; its first consignment reached this country this year. That was the result of three years' work, which required practically all the research staff working collectively upon it.

55,952. I suppose the initial pay is equal both for the administrative officers and for the research officers?—No, not necessarily; I think our entomologists certainly enter at rather higher rates; but at the present moment the salary varies in nearly every colony. The idea of the general service is to obviate that and to have them all on a uniform basis and so more readily transferable.

55,953. But when you have your cadre and this interchange of officers throughout the colonies, will you make any differentiation in favour of research workers as compared with purely administrative officers?—Yes, the research workers will certainly get rather more, partly because of the liability to transfer.

55,954. I come to this question of rinderpest and immunity in Kenya. I should like to be quite clear about the factors of success. Is it not a fact that in Kenya you have been successful because of the existence, in fairly large numbers, of Europeans owning very large herds, and you have the same case as regards cattle in tribal ownership?—As a matter of fact, it is not true to say that the cattle are really in tribal ownership; it is one of the few forms of definitely private property that you get in some of the primitive tribes. Admittedly, the tribal element comes in; but if you take the purely pastoral people of Kenya and Tanganyika, there may be 10,000 head of cattle in the big herds, but you will find that a large number belong to one individual. As to your first question, whether it is due to the European: undoubtedly the necessity and the vocal urge of the European demanding protection for his high-grade cattle that he had imported, led to an early attempt on the problem which was very welcome and benefited others as well; but in other places, such as Nigeria, Tanganyika and Uganda, there is no European-owned cattle and the same problem has been faced and is being tackled entirely with native herds.

55,955. My point is that there you saw the problem on a large scale and you were able to attack it?—That is true.

55,956. But in India we have millions of small cultivators owning one or two head of cattle each?—Yes, that is a much more difficult problem.

55,957. I should like to have your opinion as to the financial results of this policy of cross breeding, especially for milk; does that policy pay in the long run?—It is very difficult to say. Among the native cattle in Africa we have had no economic dairying, that is to say, no production of dairy products for sale; that is practically non-existent in these places. In fact, the only production of dairy produce for sale, taking Kenya, is the European enterprise, making cheese, butter and so on. A certain amount of rather indifferent *ghi* is produced. There are a good many Indians in East Africa who would rather import *ghi* from India than consume the *ghi*

which is produced by the tribes round Lake Victoria. Of course, the bulk of the natives have never looked upon their animals from the point of view of milk at all; they have looked on them from the point of view of meat for themselves, as a form of wealth, as their cash balance, for doweries and as giving a status in life; practically, the only economic purpose for which they look to their cattle is the sale of the hide. But still, that is changing.

55,958. But is this policy, as followed by the Europeans, of crossing the country cattle with imported cattle successful in its financial aspects?—Yes, I think quite certainly that there are a considerable number of pastoralists in Kenya who have made considerable sums of money out of that. They can buy the native *gumbi*, as they are called locally, very cheap; they get a good imported bull, they do improve the animal generally for all purposes, and they are successful. It is one of the industries that is paying.

55,959. But after the second generation, if the operation is repeated, the cross-bred animal is no good?—You are asking me a question that is a little beyond me; I have heard this question discussed, going into further generations. All I know is that I was told in Kenya that in some cases they have graded up too far. I was talking to one of the leading pastoralists there, and he said that he made that mistake and he said he was going to grade down, meaning that he was going to breed so as to have a higher proportion of the native, on the ground that it was definitely better for the circumstances of the country.

55,960. With regard to the scheme for the expansion of Imperial bureaux, I understand you have at present only two: Entomology and Mycology?—Yes.

55,961. Do you think it would be good to have a bureau dealing with crops, so that information would be available at a centre for the various parts of the Empire?—Yes. The whole question of crops is a big one. There are two that I think we want definitely at present. We want a Bureau of Soil Science; that is to say for the chemistry, physics and biology of soil, namely, putting the Rothamsted work on an Imperial basis. The other is the question of plant genetics. From the point of view not only of the food production for local consumption in all these colonies, but from the point of view of the economic crops, it seems to me the biggest thing we have got is the work on plant genetics. Whether you are dealing with coconut palm, with rice, or the guinea corn, the crux is not merely seed selection, though seed selection is one aspect of it, but the whole improvement of the yield and bearing of the crop and the breeding of the new types. I mean we want "Biffen wheats" in every single product. That work is gigantic and the experience of the whole world ought to be pooled in that article. A Bureau of Plant Genetics seems to me to be absolutely essential and vital.

55,962. In this scheme of locating imperial research centres throughout the Empire, are you going to locate some imperial centres in India?—That is for you; I am only speaking about the Colonial Empire.

55,963. What relationship should we have then?—I hope that we shall be linked up through this Bureau and by much more frequent personal intercourse than we have had hitherto; that is to say, men from your stations could come and visit ours, and men from our stations could go and visit yours; there should be personal contact between the workers as well as through the Bureau.

55,964. *Mr. Kamat*: Would you like the idea of having joint conferences of research workers in India and in the Colonies?—Certainly; I see no reason why conferences could not move about the Empire, just as the Forestry Conference does; it met last time in Ottawa; it is going to meet next year in Melbourne. I think it is very important that these conferences should meet throughout the Empire.

The Right Hon. W. G. A. Ormsby Gore.

55,965. *Sir James MacKenna*: I think you told us that you have institutes for the manufacture of anti-rinderpest serum?—Yes.

55,966. In what sort of climate are these institutes located?—I have visited two or three of them. The Tanganyika one is at a place called Mpapawa; that is about 150 miles inland from Dar-es-Salaam, up the central line straight in from the coast; and I should say it is situated at about 2,500 feet above sea level; the latitude is about three degrees South of the Equator.

55,967. What is the maximum temperature?—It is often 100 in the shade.

55,968. Do they work all the year round there?—Yes; there are cooling arrangements, and so on.

55,969. But the actual climate itself is hot?—Yes, it is hot. The institute in Nigeria is on the only plateau in Nigeria; that is about 4,000 feet up; that is in some of the hottest country. I will not say that works all the year round, because in the wet season there, which is on now, very little movement of anything takes place.

55,970. Is this anti-rinderpest serum manufacture done by veterinary or by medical officers?—Veterinary.

55,971. Has this simultaneous inoculation been done entirely by European assistants, or is it done by native assistants?—We have native assistants doing the actual inoculation of these big native herds. The preparation of the serum and teaching of these men is done by Europeans, and there are a certain number of Europeans doing the actual inoculation, too; but in Northern Nigeria it is carried out by the local Hausas.

55,972. I ask that question because, in India, we are always told that it is such a difficult operation that it can only be entrusted to a highly skilled officer?—Oh, no.

55,973. *Professor Gangulee*: Do you know if the Departments of Agriculture in the Colonies make charges for inoculation of cultivators' cattle?—I forget; I cannot tell you that without reference.

55,974. The serum is supplied free to different stations?—That is right. It is prepared centrally in each territory and then sent out to distributing centres.

55,975. I think there are some Indian cattle in Jamaica?—Yes, I have seen them, the Mysore cattle.

55,976. Can you tell us how they flourish in that country?—They are the only cattle that I thought did flourish there. I believe others do; but, of course, there the enemy is the tick; the tick-borne fever is the trouble in Jamaica, and undoubtedly Mysore cattle are immune.

55,977. Do you think there is a great deal of scope for the export of Indian cattle to these various parts?—Yes, I think more could be done in that way. Certainly, the vast Nigerian herds are cattle of an Indian type; they are the humped Indian type of ox. How or when they came there, I do not know

55,978. Do you have a central research station to go into the question of animal breeding?—We have done all too little about that; we are only just beginning.

55,979. And there you combine the veterinary research and animal genetics?—Yes, I hope so.

55,980. You combine the two branches of animal husbandry in the one research station?—Yes, and animal nutrition, too.

55,981. So that the three branches of animal husbandry are combined in the one station?—Yes.

55,982. Is Trinidad affiliated to any University?—I am afraid I do not know offhand whether it is or not; I do not know whether its degrees are accepted by any other University.

55,983. You give post-graduate training there?—Yes; there is also a three years' course, which entitles a man to the diploma of that college.

55,984. Are the students who work there, in the post-graduate department, entitled to any degree?—No, the students who are working there as post-graduates, with a view to entering the Colonial Service, have already got their degrees or diplomas before they go there.

55,985. But they do not get the M Sc.?—They do not get anything further. To the best of my recollection, the Trinidad degree is only given after a three years' course at Trinidad, and most of these post-graduate students only take a one-year's course, having already got a degree.

55,986. For instance, an M.Sc. student from Cambridge carrying on certain work at Trinidad would not receive an advanced degree?—I do not think so.

55,987. In the Imperial College at Trinidad some research is going on, too?—Yes.

55,988. So that there is the advantage of post-graduate training in the same institution where researches are being conducted?—Yes.

55,989. The Director is also the Director of Research?—Yes; the staff is mainly a teaching staff, but there are one or two people doing research there, and a certain number of these are put up by individual workers there. As you see, it is a new institution; we have developed it mainly as a training institution at present. We shall have to develop the actual research side. It is very much needed. Some of the problems of tropical fruit we clearly envisage as being done at Trinidad by research workers at the College.

55,990. Would you like to see the research and post-graduate training developed at the same institution?—Not universally, by any means; in fact, I am not sure that at the present stage I want any other of our proposed chain of research stations to take on training; I want to concentrate the training, as far as the Colonial Empire is concerned, at Trinidad.

55,991. With, of course, a central research organisation in Trinidad?—Yes, with a research organisation in Trinidad. But at Amani in East Africa that will not be a training institute; that will be a research station. Similarly Ibadan in West Africa, one of the biggest research stations in West Africa, may become the central research station for the whole of West Africa. I should not imagine that training would necessarily go on there at the same time.

55,992. Is it your view that for post-graduate training the research atmosphere is fundamentally necessary?—I think it is important.

55,993. If you have a number of bureaux as you suggest, do you think it will be necessary to have a directing agency?—You mean a common directing agency for all the bureaux?

55,994. Yes, just as they have in America?—I am not sure of that. I should like to have that considered when we have got all the other bureaux established.

55,995. You are thinking of a concerted agricultural research policy for the Colonial Empire; are you thinking of formulating a policy for agricultural education in Africa?—Yes, quite certainly and in the broadest sense; not only do we realise the fact that we cannot really get the results of research applied or get the agricultural departments adequately staffed with European officers, but we have got to train African natives through all grades of the work of the agricultural departments. But, in addition to that, of course we realise that we have got to deal with agriculture in the schools for the mass of the people as well. There are no industries and there are practically no towns, and therefore all education has got to have a far stronger agricultural bias than it has hitherto had.

The Right Hon. W. G. A. Ormsby Gore.

55,996. Teaching agriculture in ordinary schools?—Yes. For instance, it is already established in Sierra Leone; our Teachers' Training College for the native teachers in all the village schools throughout the Protectorate has been established at a place called Njala, which is also the central agricultural research station and experimental farm where the native agricultural assistants are being trained by, and for, the Agricultural Department. The ordinary teachers have got their college in those grounds in close contact with the agricultural work that is going on, and that is being followed in the two new Government training institutes in Southern Nigeria; we are placing our new training college for ordinary teachers in close contact with the two principal agricultural stations, and we are forging every link we can between our Agricultural Department and our Educational Department.

55,997. *Mr. Kamat*: You know that for the whole of India we have one central research institute at Pusa?—Yes.

55,998. By way of analogy, I should like to know what is the biggest area in the colonies which is served by a single central research institute?—Nigeria is one-third the size of British India; that is to say, it is seven times the size of England. That is the only example of where we have one station at the present time trying to cover an enormous area. We have got to decentralise.

55,999. In the matter of choosing the problems for research, do you allow the fullest latitude to your research officers to take up those problems, or do you set them problems which the native population want to be solved according to your requirements? Do you give priority in that way?—It is bound to be to a certain extent a little of both; you cannot make that absolute dichotomy, it seems to me. In the main, I think at our present stage in the Colonies such researches as are undertaken have got to be undertaken in the order of priority as the Director of Agriculture responsible for the agricultural policy as a whole sees their urgency. The same is true in veterinary matters; that you deal with the rinderpest first and then go on to deal with the other diseases. There must be an element of priority; you concentrate on problem after problem in the order of their urgency. But quite frankly, we must look beyond that; we have got to look to the Tropics, India and the British Colonial Empire, to make a very distinctive contribution to world knowledge in all these matters. That is why I think an extremely fine field is open to research workers in these places. If a research worker sees a problem in the course of his investigations on one particular crop, it may have immense ramifications which ought to be followed up. There ought to be somebody watching to see where these valuable lines can be followed up.

56,000. *The Chairman*: You are probably aware that many of the appointments of European research workers to India in recent years have been for either five or ten years. A five or ten years' appointment is a little unattractive to the research worker sometimes, because it does not afford the degree of security for his future which he requires. Would it be conceivable, do you think, that these five or ten years' appointment men could be members of the pool which you have been describing?—You mean members of our pool where we could link up fairly soon with an Imperial pool?

56,001. Yes?—Of course, we envisage getting our own pool started first, and then anybody liking to link up with the pool. We should consider it as they put it up to us.

56,002. Naturally; but one sees no reason why, if the proper financial arrangements could be made, Europeans, at any rate those who might be available for these five or ten years' appointments, should not be members of your colonial pool?—Quite; that might be possible, though it would require consideration: but let me say unhesitatingly that there may be, in our service, openings for Indian research workers. I have seen at

Rothamsted in Hertfordshire a first-class Indian research worker working in the laboratories there. I do not see why a scientific service of the kind contemplated should be absolutely confined to Europeans, for science knows no boundaries, racial or otherwise.

56,003. Are you personally interested in the Empire Marketing campaign?—I am the Vice-Chairman of the whole Board, the Chairman of the Publicity Committee and a member of the Research Grants Committee.

56,004. Have you any indications yet as to how far the patriotic motive influences buyers in this country: how far the term "Empire goods" is a good selling description?—Some people on my Publicity Committee say that that is so very decidedly.

56,005. Already?—Already. I think certainly that you can see from some of the more enterprising of the big distributors of this country and the type of advertisements that they are using that that is so. I think that element does enter in with an increasingly large section of the population. Of course, the main difficulties are regularity of supply and uniformity of quality, which we have not yet got.

56,006. Do you see any reason why India should not have its fair share of any benefit which is likely to accrue?—No, I think they should; I think India will. You are very admirably represented on all those Committees by Mr. Lindsay, and he keeps us up to the mark. I think India certainly should.

56,007. *Sir Thomas Middleton*: Do you think it will be possible to adhere to your policy of one tropical training centre for your scholars?—No, it may not be. We had an opportunity of getting a start at Trinidad owing to the patriotic efforts and energy of one or two individuals, and I think probably the time will come, and come rapidly, when Trinidad which suffices just for the moment, will have to be supplemented by something else.

56,008. Our policy here is to select for the scholar the station to which he is to go; it entirely depends on the man himself and his outlook and intentions as to what research station we send him to. I think it will be essential for you to send your scholars to the men who are best qualified to look after them and train them?—Yes. Of course the main point about Trinidad was this, that we had before to send out a considerable number of people straight from the English Universities who were quite good scientists but they had learned with the background of British condition: with frosts and all the things they had grown up to; and then they were certainly put into conditions which were absolutely different. The fundamental science no doubt is the same, but the conditions were so different that they were like fish out of water. Now they have got a place to which we can send them where they can be introduced to tropical conditions.

56,009. It might be possible to introduce them to the tropics and to their special problem at the same time?—Yes, they are introduced to the problem and to the type of crops. I will hand in, if you like, a statement* of the agricultural products of the principal Colonies for the year 1926 which were exported.

56,010. *The Chairman*: May we have that?—Yes, that shows the amount and the values for last year, and the order of importance by groups of Colonies.

56,011. Are you familiar with the advertisement campaign designed to increase the consumption of British tea?—Of course, tea advertising is so tremendously undertaken already by the trade, and the trade is so big in the major tea companies that it would be very difficult to do anything except through the trade.

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* See Appendix on page 485.

56,012. Do you think there would be an advantage if, for instance, various associations concerned with this business would join together in one central association? You have the Indian Tea Association, the Ceylon Tea Association, and so on, advertising, not directly each against the other, but in some degree of competition?—I think it would be a very good thing if you could bring the trade associations together. I think there is a great deal in that.

56,013. It cheapens advertising?—Yes, I should think so. I believe the tea people say that tea advertising is one of the examples of an almost exact mathematical return for the money spent on advertising; that it can be almost worked out.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Monday, the 27th June,* 1927.

APPENDIX.

Colonial Agricultural Exports.

Statement of Tropical Crops in order of importance to different groups of Colonies, based on relative value of exports for the year 1926, *or if not yet available,* 1925.

(a) *Carribean Group.*

(Comprising Jamaica, Trinidad, British Guiana, British Honduras, Windwards, Leewards, Barbados and Bahamas.)

	£	
(1) Sugar	4,215,532	
(2) Bananas	2,094,119	
(3) Cocoa	1,618,910	
(4) Coconuts and Copra	466,628	
(5) Coffee	347,057	
(6) Cotton	188,171	
		9 millions

(1925 figures only available in the case of Trinidad, British Honduras, St. Lucia, St. Vincent, Leewards and Barbados.)

(b) *West African Group.*

(Comprising Nigeria, Gold Coast, Sierra Leone and Gambia.)

	£	
(1) Cocoa	10,423,798	
(2) Nuts (chiefly ground nuts and palm kernels)	9,496,914	
(3) Palm Oil	3,767,897	
(4) Cotton	1,182,614	
(5) Hides and Skins	630,023	
		25 millions

(c) *East African Group.*

(Comprising Kenya, Uganda, Tanganyika, Nyasaland, Northern Rhodesia and Zanzibar.)

	£	
(1) Cotton	3,582,366	
(2) Sisal (Fibre and Tow)	1,507,591	
(3) Coffee	1,392,711	
(4) Coconuts and Copra	580,112	
(5) Tobacco	519,043	
(6) Hides and Skins	446,640	
(7) Ground Nuts	291,869	
		8 millions

(d) *Far Eastern Group.*

(Comprising British Malaya, Ceylon, Mauritius and Fiji and Western Pacific.)

	£	
(1) Rubber	97,617,865	
(2) Tea	16,055,299	
(3) Coconuts and Copra	10,066,612	
(4) Sugar	4,982,775	
(5) Fresh and Canned Fruits	1,077,050	
(6) Cocoa	228,491	
		120 millions.

(1925 figures only available in the case of Mauritius. Figures for Fiji and the Western Pacific relate to years between 1923-24 and 1926.)

162 millions.

Monday, June 27th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Mr. JASPER KNIGHT, representing Messrs. Jurgens, Ltd.

Oral Evidence.

56,014. *The Chairman*: Mr. Jasper Knight, you are a Managing Director of Messrs. Jurgens, Limited, a firm engaged, I think, in the manufacture of margarine?—Yes.

56,015. In the course of their trade, your firm handles large quantities of groundnuts?—Yes.

56,016. Is that the principal source of oil supply for the manufacture of margarine?—For the best grade of margarine it is almost 100 per cent., for the top grade margarine; but it does not enter into the cheaper brands.

56,017. Are you satisfied with the quality of the groundnuts that you are able to buy in the London market?—The Coromandel groundnuts would certainly realise a better price if means could be found to reduce the fatty acids and keep the quality more uniform; they are the least uniform of all the groundnuts that we buy.

56,018. Do you buy in London or Liverpool or do you buy in India?—Almost exclusively in London for the whole of our factories all over Europe.

56,019. You never buy in India?—No, never.

56,020. Do you find it necessary to inspect each parcel of groundnuts or do you buy on the designation?—We buy entirely under designation; we are buying, for instance, new crop at the present moment for December-January shipment, so that of course we have no opportunity of seeing them.

56,021. Do you buy on a definite contract?—Yes, on the contract of the Incorporated Oil Seed Association, and consignments are judged by the standard of that month's shipments; they make up a standard at the Incorporated Oil Seed Association for the shipments from the Coromandel coast for each month, and then each individual shipment, if there is a claim for allowance, is judged in comparison with the standards for the shipments from India for that month. There are two distinct descriptions of groundnuts; dry decorticated and the ordinary Coromandel groundnuts, and there is quite a wide difference in price. We have the feeling that when we get an exceptionally bad shipment of dry decorticated Coromandel, in all probability a certain quantity of ordinary Coromandel have been.

mixed with them. If anything could be done to prevent that, it would certainly help the dry decorticated to realise a better price in comparison with Chinese and Nigerian.

56,022. Do you associate an excess of free fatty acids with damping for the purposes of decortication?—Certainly.

56,023. Would you regard the fixing of a maximum percentage of free fatty acid in India, that is to say, under some scheme by which an export standard would be insisted upon, as advisable?—You mean that they should not be allowed to leave India unless up to a certain standard?

56,024. Yes; have you any suggestion of that sort in your mind?—No, I do not think so, because anything of that sort would have to be mutual; we should have to have a basis with a pay or receive. You see, from my figures here* the free fatty acids of Coromandel are practically the highest of any description of groundnuts that we buy. Of course, the Bombay are much better, but then the oil content in Bombay is very low. I really do not know why the oil content of Bombay should be so much lower than in Coromandel. If anything could be done to maintain the oil content of Coromandel and reduce the fatty acids, that would certainly secure a higher average price for the crop.

56,025. You also attach great importance to uniformity?—Absolutely, yes.

56,026. How long have you been buying groundnuts?—I have been in that market for about 27 years.

56,027. Have Indian groundnuts improved generally in that period?—I should say they have improved rather.

56,028. Have they held their own in competition with groundnuts from other parts of the world?—The whole trade has increased so enormously of late; since the War the whole groundnut production of the world has increased. Do you mean in quantity?

56,029. In the most general way, I mean?—I should say there has been a far bigger increase in production in India than in any other country in the world, and they are now the price-making crop of the world. I would say the Indian groundnut crop governs the price of the groundnut crop of the world.

56,030. You say there has been a very important increase in the world production; do you think India has had a fair share of that increase?—Certainly.

56,031. *Professor Gangulee*: Has the quality improved?—I have only been connected with Jurgens since 1919; before then I was a broker in oils and oilseeds on the Baltic, and when I was a broker I did not have the opportunity of knowing so much about quality as I do now; as between 1919 and the present, I should say there is very little change.

56,032. *The Chairman*: I see that, in the table provided by you, the free fatty acid percentage in the case of Chinese groundnuts is very low?—Extremely low, except this year; this year, for some reason or other, they have been extraordinarily bad; I do not know why.

56,033. Have you any suggestion for the better packing or marketing of groundnuts?—No, absolutely nothing; only the question of measures to prevent any mixing of ordinary Coromandel with the dry decorticated. The difference in appearance is very very difficult to detect; we cannot help feeling that a certain amount of that is done, and some of the shippers certainly are of opinion that it is done by the less scrupulous shippers. Of course it may not be true.

56,034. Do you recognise any of the newer improved varieties of groundnut which have been recommended by the agricultural departments in certain Provinces in India? Would you recognise them when they appear on the London market?—I suppose Khandesh is one of the varieties to which you refer; we have had a few Khandesh.

* See Appendix on page 446.

56,035. Do you like them?—Yes, certainly; they are better than the Coromandel, as you see from the figures. During the first three months of this year what we have received in Germany (the Khandesh), go nearly 4 per cent. better than the Coromandel; but there, again, the oil contents are lower; that seems to be the difficulty: to maintain the oil contents without increasing the fatty acids. That is the problem.

56,036. *Professor Gangulee*: Do you associate high percentage of free fatty acids with the prevalent practice of moistening the nuts before shelling?—Yes.

56,037. So when you get nuts undecorticated, you would not have these free fatty acids?—Certainly. You see the Senegal groundnuts and the Gambia groundnuts are shipped exclusively undecorticated, and there the free fatty acids are enormously lower; they are very often under 1 per cent.

56,038. Is the moisture figure, that you give us here in the table, on the sample that you obtain?—It is.

56,039. Do you associate the high percentage of moisture with the excess of free fatty acids?—No, I do not think they necessarily go together.

56,040. So that the only point as to these free fatty acids is this, that if you could have the nuts undecorticated or decorticated without moistening them, the percentage of free fatty acids would naturally go down?—Yes. Dry decorticated are decorticated without moisture, are they not?

56,041. Quite?—That is why the percentage of free fatty acids in that case is lower than in the ordinary Coromandel.

56,042. The groundnuts containing a high percentage of oil get a premium price in the market?—They would if you knew it, yes; but you buy on a forward contract, and the price of Coromandels and Nigerian is more or less the same, partly because the Coromandel contract is a more favourable one to the buyer than the Nigerian contract; but that is a matter of detail. The Nigerians are actually worth more if the contract terms were the same.

56,043. In the contract terms, you do not specify the percentage of oil content?—No.

56,044. So that, for instance, if the agricultural departments in India were to evolve a type of groundnuts with a high percentage of oil content, that would not bring a premium price?—Certainly it would; we should soon find out by experience that the quality of the Coromandels was improving and then they would certainly obtain a premium over Nigerians in the market.

56,045. Have you any views with regard to regularity of supply? That is a very important factor. Are you satisfied that the supply of groundnuts from India is regular?—Of course it is shipped more or less in certain months; it is not spread equally all over the year. It would naturally suit us better if the shipments were spread all over the year because, as it is, we have to buy vastly in excess of our immediate requirements and store them in Europe from January to March, because the shipments are considerably lighter later on.

56,046. Do you have to store here?—Yes, we store here very largely.

56,047. And you lose a great deal on account of storage?—I do not think we lose oil, but the free fatty acids go up.

56,048. That interferes with your process of manufacturing margarine?—To a certain extent, yes.

56,049. Have you any views as to how this regularity of supply can be obtained?—I do not think that is possible; when the groundnuts come in they want to sell them; the shippers do not want to hold them up. I do not think you can alter that. It applies to every crop as well as groundnuts when you have a heavy shipping period.

56,050. Does the shipping period from India coincide with the shipping periods of other countries?—Yes, absolutely; in the whole world the shipping period is more or less the same.

56,051. So that there is a glut in the market at that time?—Absolutely.

56,052. Do you think it would be a good thing to hold a part of our groundnut crop in India so that our shipments would not coincide with the shipments from other places?—If that were practicable it would probably enable a better price to be obtained.

56,053. *Sir Henry Lawrence*: Can groundnuts be kept for a long time without deterioration?—They keep better in India than they do over here on account of the drier climate.

56,054. While still unshelled?—If they stored them unshelled they would keep better still; I was thinking of the decorticated groundnuts.

56,055. Would not they shrivel up inside?—No, I do not think so; they have got a red skin inside which I think would prevent them shrivelling. It is the damage to the nut in decorticating that causes the generation of free fatty acids.

56,056. *Mr. Calvert*: I think you said that groundnut forms about 100 per cent. of the better quality of margarine?—Yes.

56,057. Does copra come into the other qualities?—Yes.

56,058. Are there any firms dealing in margarine who owns estates in India?—No, I have never heard of any.

56,059. Is there any touch between firms dealing in margarine on this side with Agricultural Departments on the other?—Not that I know of.

56,060. You are not informed of what is being attempted there to improve the groundnut?—Only by firms such as Ralli Brothers, Dreyfus and Volkart Brothers; not by any Government Departments.

56,061. Do you know, for instance, whether the efforts of the Agricultural Departments out there are being guided as you would wish them to be guided?—I think the shippers know perfectly what is required, such as Ralli Brothers, and if any Government Department applied to Ralli Brothers for advice they would get it just as well as they would from any margarine maker.

56,062. *Mr. Kamat*: You say the Khandesh variety is good?—Yes.

56,063. Are you referring to the new Khandesh variety or the variety which we used to ship from India some years ago?—I am referring to the arrivals, as you see on this list here, between 1st January and 31st March of this year; you see they run three and a half per cent. below Coromandel.

56,064. That variety is not an indigenous Indian variety; it is called the Spanish peanut; it has been introduced by the Agricultural Department during the last few years?—Is that so?

56,065. Do you like that variety?—Yes, certainly. Our opinion of the groundnuts is absolutely indicated by these figures; we want the lowest possible free fatty acids but not too much reduction in oil contents.

56,066. The point I am trying to make is this: There is a regular indigenous variety in Khandesh and there is a newly introduced variety called Spanish peanut, which is more or less a foreign variety?—Yes.

56,067. Out of these two, which I presume you have tried, which is the better?—I do not know; I have not heard of two varieties of Khandesh.

56,068. You have been in the trade for some years?—Yes, certainly.

56,069. Have you any recollection of the quality of the variety which you used to get from Khandesh or Bombay, say, ten years ago?—No, because, as I say, at that time I was a broker and I never saw the groundnuts; now, being a consumer, I do see the groundnuts. When you are a broker you only hear about them when there is trouble, when there is a claim or something. In the ordinary way you hear nothing.

Mr. Jasper Knight.

56,070. With regard to this question of a regular supply groundnut cannot be held in stock in India in good condition more than six months; after that it goes either rancid or loses greatly in weight; that is the experience?—Is that in the shells or with the shells off?

56,071. With the shells off?—But with the shells on you could probably hold them much longer.

56,072. I am telling you from experience; the experience of merchants is that, beyond nine months, one is bound to lose if one stocks groundnuts, either shelled or unshelled; therefore, one likes to ship it off as quickly as possible to get the best price. Would you suggest any method by which the stock can be held without losing either in weight or going rancid?—No, I can only tell you that we can hold them over here for six months very easily, practically without any effect on the quality, if they are properly handled and kept on the move. We keep them on the move all the time; keep drawing nuts away from the bottom of the silo and putting them in again on the top. If we keep them on the move, holding them decorticated like that, it prevents any possible heating or anything, and we get better results, holding them in that way, than if we do not keep them on the move.

56,073. By constantly keeping them on the move you can maintain the quality much longer?—That is right.

56,074. In India, merchants keep them in the godowns and, I believe, have not the idea or have not the means to keep the whole stock on the move?—That would make a lot of difference.

56,075. That is a suggestion, I think, that India ought to take up?—If you have facilities for keeping them on the move it will certainly enable you to hold them longer.

Sir Thomas Middleton: You have no trouble until the end of May, have you, Mr. Kamat?

Mr. Kamat: No, not till the end of May; until then they are safe.

56,076. *Sir Henry Lawrence*: Do you know what the quantity of groundnut exported is, as compared with the quantity locally consumed in the country?—I have no idea, in India; I believe figures are published in the Rome International Statistical Department, but I have never noticed them.

56,077. Is the nut equally valuable for your purposes, for the extraction of oil and for eating?—The nuts that are used for confectionery, and in other ways of that sort, are almost exclusively Chinese hand-picked. I do not know why, but those are the species that are preferred for that purpose.

56,078. They are probably much more expensive, are they not?—Yes, a little, not enormously more. After all, if they are selling them in the way they do, a pound or so a ton does not really make much difference when they are used for confectionery and that sort of thing.

56,079. You want as much oil as possible in the nut, do you not?—Certainly, because every ton of oil we produce is worth £40 and every ton of cake we produce is worth about £9; so that every one per cent. of oil in the groundnuts makes a difference between £40 and £9; every extra one per cent. of oil increases the value of the groundnuts by 6s. a ton.

56,080. That extra quantity of oil may make it less palatable for eating?—You mean for eating without crushing?

56,081. Yes?—You see, from the figures here the Chinese are slightly lower: forty-four per cent. of oil against nearly forty-eight; three to four per cent. lower; but provided the free fatty acids are not high, I do not think the extra oil content would make it less valuable for eating; it is the free fatty acid that makes it unpalatable.

56,082. Supposing three-quarters of the crop is eaten in India, can we then ask the cultivator to grow a nut that is more suitable for you, when threequarters of his crop is eaten locally and becomes unpalatable? Have you looked at it from that point of view?—No, I have not; but the point we are mostly concerned with is the free fatty acids, and a reduction of that would make them more palatable for eating; we are not so concerned about increasing the oil content. If the free fatty acids could be reduced in Coromandel nuts without reducing the oil content, that would be an improvement.

56,083. Are you acquainted with the operations of the Tata Oil Mills in India?—I have heard of them and I know the firm of Tata, but I do not know much more about it.

56,084. Did they attempt to deal with groundnut or coconut chiefly?—I think coconut.

56,085. Groundnut did not come into their operation?—I think not.

56,086. Do you deal in coconut?—In copra, certainly.

56,087. Copra from the coconut?—Certainly.

56,088. Do you export coconut from India for that purpose?—We import copra from all over the world, principally the Straits and Dutch East Indies; we have oil mills all over Europe and we buy copra from all over the world and crush it.

56,089. Is any of the Indian coconut exported to you?—I have never heard of it, no; we buy, very occasionally, a certain amount of Cochin coconut oil, which, I believe, is Indian, but never copra. Malabar is Indian copra, but we practically never buy it. It is the highest grade of copra there is.

56,090. What is that used for?—It is used principally by people with very antiquated methods who are incapable of producing a refined oil except out of the finest copra; it goes principally to Scandinavia.

56,091. *Mr. Kamat*: Malabar copra is the same as Cochin copra; Malabar is the tract and Cochin is the port?—It principally goes to Scandinavia, because they are not very up-to-date in their methods.

56,092. *Sir Henry Lawrence*: The Tata Oil Mills are putting on the market in India a form of vegetable *ghi*?—We sell vegetable *ghi* in India to a very large extent; we make it in Holland and export it to India.

56,093. Is there a distinction between vegetable *ghi* and margarine?—Yes, we make it as nearly as possible to resemble the native *ghi;* we try to produce as nearly as possible the flavour of the native *ghi*. I am not a technical man; I cannot tell you exactly what difference there is in the process of manufacture; it is made from exactly the same materials but there is a difference in flavouring; they like something fairly strong.

56,094. How does the Tata cocogen differ from margarine?—I expect it is very much the same as what we produce; I have never seen it.

56,095. *Mr. Kamat*: Cocogen is a liquid product?—Ours is a solid. Native *ghi* is almost solidified.

Professor Gangulee: I think it depends on the weather whether it is liquid or solid.

56,096. *Mr. Kamat*: Cocogen can never be solid; even in the worst of winter cocogen in India is always a liquid; it is made from coconut oil refined?—Coconut is a hard oil; it is quite solid at a temperature of 70 to 75.

56,097. Cocogen can never look like margarine; it is purely for cooking purposes?—Ours is made as near as possible to look like native *ghi*. I do not know anything about Tata, but I do not know how they make

a liquid product from coconut oil. Would it be liquid at a temperature of 70 degrees Fahrenheit?

Yes, at ordinary temperature it is liquid; it cannot stand on the plate like a pat of butter.

56,098. *Sir Henry Lawrence*: Is any animal fat mixed up with your vegetable *ghi*?—No, because it is objected to, and it is far too expensive.

56,099. Is there any vegetable *ghi*, imported into India, which contains animal fat?—I should say absolutely not; apart from the fact that it is guaranteed not to contain animal fat, there is no inducement from a price point of view, because the only animal fats that are ever used are premier juice, neutral lard and oleo, all of which are far dearer than the vegetable oils.

56,100. That is a very important point. Is there any prospect for the export of coconuts from India, or is their price too high for internal consumption to enable them to compete with the world market?—I do not know anything of conditions in the copra business; all I know is that the export of Malabar copra is very very small and always has been; it never could be big. At the price the stuff realises now, if the shipments were bigger the value of Malabar copra would come down nearer to the level of Straits and Dutch East Indies, because the people willing to pay the present high premium are not very numerous. It is quite a small thing; Malabar copra is a fancy article and only bought by a few small people.

56,101. Is the demand for coconuts unlimited? Is there room for much expansion of cultivation in India?—Yes, the copra crop to-day is the biggest thing in the world, so far as oils and oilseeds go; it is roughly round about a million tons, producing about 630,000 tons of oil; a few hundred thousands of tons more or less would not matter; the demand is constantly expanding.

56,102. Then why is it that various companies are rooting up their coconut trees and substituting other things?—In India?

56,103. I was thinking of Ceylon and the Federated Malay Straits?—I have never heard of that; we find the production of copra constantly increasing. I had no idea that anybody was rooting up coconut trees.

56,104. It may not be a common practice but that seems to be the state of things with certain companies?—I cannot tell you.

56,105. *Sir Thomas Middleton*: I see one of your shipments of groundnuts in 1927, Red Natal, had eleven per cent. of free fatty acids. What becomes of material of that sort? Can you use it for making margarine?—No, probably not. You cannot lay down a hard and fast rule about free fatty acids, but the cost of manufacturing margarine from groundnuts with that percentage of free fatty acids would be very high. The Red Natal is an Indian groundnut; it comes from India. We had only one shipment from Messrs. Ralli Brothers and they turned out very badly.

56,106. I suppose it got damaged badly?—I suppose so; it was only a small lot and it was really no guide.

56,107. What is the highest percentage of free fatty acid you can deal with in the ordinary way: five per cent.?—No, we can deal with higher than that: I think eight or nine per cent.; it would only mean increased cost. It means a higher yield of acid oil, which goes for soap making, and an increased use of ingredients.

56,108. The variation in the oil in your purchases is somewhere between 44½ per cent. and 49 per cent.?—That is right.

56,109. Do you not buy on the unit system?—No, because that would have to be mutual and we could not really gain much; I mean if we get a better groundnut, you cannot have an oil basis without having mutual pay or receive.

56,110. I should have thought it would pay you to buy on the oil basis. It may be that the nuts which contain the lower percentage of oil are the best cropping nuts, and the most profitable to grow; and if the trade bought on the oil basis it would pay the cultivator to grow big crops without reference to the percentage of oil?—Our feeling in the crushing trade is that, if you remove every element of risk, you make the competition worse than it is at present. You see what I mean?

56,111. I understand quite. Do you use palm kernels now to any extent?—Yes.

56,112. How does the margarine made from palm kernels compare with that made from copra, for example?—Palm kernel oil and coconut oil are practically interchangeable.

56,113. And with regard to groundnut?—The groundnut is in a different category; it is a different liquid. Palm kernel and coconut are hard oils. When we make margarine from groundnut oil exclusively we use it partly liquid and partly hydrogenated, hardened with hydrogen, so as to get the butter texture.

56,114. Has the production of pure vegetable margarine for the British market increased in the last ten years or so?—I should say it has. It depends entirely on the production of butter. Whatever butter is imported is used, and margarine makes up the difference. You can say in round figures that the consumption in the United Kingdom is about 12,000 tons a week of butter and margarine, and roughly it is 50-50: about 6,000 tons of each; but if butter is plentiful the consumption of margarine goes down.

56,115. That is as regards the total consumption of margarine?—In England, yes.

56,116. If you go back to the period before the War, the more expensive varieties of margarine all contained premier jus and oleo, and the cheapest varieties were purely vegetable; during the War the percentage of vegetable margarine was worked up very rapidly. What I ask you is whether there has been a continuous rise in the use of vegetable oil for margarine as compared with these made partly from animal fats?—Yes, but the sale of the top grade margarines is a very small thing in the United Kingdom as compared with Germany; in Germany there has been a very big increase in the demand for top grade margarines owing to a big amount of money having been spent in advertising, and we and the other makers of this high grade margarine have found that we get better results from 100 per cent. groundnut oil than we do from the animal fats, particularly in regard to keeping qualities. The sale of top grade margarine in England is very small.

56,117. That means that you are now able to make a top grade margarine from pure vegetable sources?—Not only cheaper, but better quality than we can with the use of oleo and neutral lard.

56,118. That was impossible in 1915 and 1916?—Yes, I should say so. We have made a good deal of progress in the refining of groundnut oil.

56,119. *Sir Henry Lawrence*: That statement applies equally to vegetable *ghi*?—The vegetable *ghi* is a business that has only developed really since the War.

56,120. But the statement that you can make better grade and cheaper vegetable *ghi* out of vegetable material than out of animal material holds good?—We have never tried with animal material because we are obliged to give a guaranteee that there is no animal material in it.

56,121. *Sir Thomas Middleton*: I do not think there was any vegetable ghi in 1914 and 1915?—I do not think so.

Mr. Jasper Knight.

56,122. *Mr. Calvert*: You have used the word "guarantee"?—Yes.

56,123. You say you give a guarantee?—We give a guarantee.

56,124. To whom?—I fancy Messrs. Ralli Brothers give it. They are our agents for the sale of *ghi* in India. The guarantee is stated on the tins.

56,125. *Sir Henry Lawrence*: How can that guarantee be enforced?—Do you mean how can it be detected? If animal fat were present in *ghi*, I think it could be detected by analysis.*

56,126. *Sir Thomas Middleton*: What are the relative percentages of moisture in margarine and in vegetable *ghi*? Margarine is limited to sixteen per cent.?—That is right. *Ghi* I do not know.

56,127. You stated that all the nuts which are used for eating come from China and are hand-picked?—Yes.

56,128. Is it the hand picking or the original quality that makes the difference?—I rather think "hand picked" means picked out by hand.

56,129. So that if Indian nuts were hand-picked they might sell on the British market as against Chinese?—Yes, but it is a very very small matter: the confectionery trade in this country, selling on the street barrows and that sort of thing, must be a very small matter.

56,130. You do not think it is worth looking after?—No, I do not; it is far to small, I should say.

(*The witness withdrew.*)

APPENDIX.

Analysis of figures of various descriptions of groundnuts received by Messrs. Jurgens' German and Dutch Factories.

(The German figures cover the period from the 1st March, 1924, to 31st January, 1926, and also the period from the 1st January to 31st March, 1927. For the period from the 1st February, 1926, to the 31st December, 1926, we have no figures.

The Dutch figures cover the period from the 31st December, 1924, to the 31st March, 1926, but we have no figures for the period since then).

1. *Groundnuts received by our German Factories during the period 1st March, 1924-31st January, 1926*:—

Description.	Bags.	Oil. Per cent.	Moisture. Per cent.	Free fatty acid. Per cent.
Coromandel ...	431,272	48·44	5·54	5·13
Niger	363,107	48·95	5·23	2·58
East African ...	13,495	45·80	5·12	3·25
China	56,107	46·58	5·98	1·64
Bombay	12,669	46·82	5·57	3·92

* *Note by Witness.*—Apart from the question of commercial morality, there could not possibly be any question of a large manufacturer breaking such a guarantee, for three very good reasons: firstly, there is no price inducement whatever to use animal fats; secondly, there is no advantage whatever from a quality point of view; thirdly, any manufacturer who put a product containing animal fats into a tin guaranteeing the product free from animal fats would be at the mercy of the first employee that he dismissed.

2. *Groundnuts received by our German Factories from 1st January, 1927-31st March, 1927:—*

Description.	Tons.	Oil. Per cent.	Moisture. Per cent.	Free fatty acid. Per cent.
Coromandel ...	17,158	47·83	5·7	6·1
Niger	13,082	47·96	4·6	2·4
Red Natal... ...	711	47·64	4·1	11·0
East African ...	725	45·85	6·2	2·1
Khandoish... ...	1,157	45·64	6·0	2·5
Bombay	2,090	45·50	5·4	1·5
China	1,536	44·54	7·6	4·4

3. *Groundnuts received at Amsterdam during period from 27th December, 1924-31st December, 1925:—*

Description.	Bags.	Oil. Per cent.	Moisture. Per cent.	Free fatty acid. Per cent.
Niger	130,079	48·5	5·2	4·0
Coromandel ...	169,094	47·9	6·3	4·8
Bold Bombay ...	21,439	45·5	6·3	1·7
China	41,198	46·0	6·6	1·6
Coromandel (d.d. Khandoish)	49	49·0	6·1	2·0

4. *Groundnuts received at Amsterdam from 1st January, 1926-31st March, 1926:—*

Description.	Tons.	Oil. Per cent.	Moisture. Per cent.	Free fatty acid. Per cent.
Khandoish d.d. ...	4,128	47·1	6·6	2·4
Coromandel d.d. ...	29,238	47·9	6·0	4·9
Niger decorticated	18,149	47·8	5·6	2·5
China decorticated	1,260	45·6	7·0	1·5
Bold Bombay decorticated	666	45·1	6·7	3·9

Mr. G. E. ROWLAND.

Chairman of Agricultural & General Engineers, Ltd., Richard Garrett & Sons, Ltd., James & Fredk. Howard, Ltd., President of The Agricultural Engineers Association, and Member of the Advisory Committee of the Department of Overseas Trade.

Note of Evidence.

1. Agricultural and General Engineers Ltd. (herein called the Group) controls the 14 firms named below, who are actively engaged in the manufacture of agricultural machinery, implements and allied products.

	Established.
Aveling & Porter, Ltd., Rochester	1850
Barford & Perkins, Ltd., Peterboro'	1840
E. H. Bentall & Co., Ltd., Heybridge	1805
Blackstone & Co., Ltd., Stamford	1837
Peter Brotherhood Ltd., Peterboro'	1867
Chas. Burrell & Sons, Ltd., Thetford	1770
Burrell's Hiring Co., Ltd., Thetford	1887
Clarke's Crank and Forge Co., Ltd., Lincoln	1859

	Established.
Davey, Paxman & Co., Ltd., Colchester	1865
Richard Garrett & Sons, Ltd., Leiston	1778
James and Fredk. Howard, Ltd., Bedford	1813
L. R. Knapp & Co., Ltd., Clanfield	1745
E. R. and F. Turner, Ltd., Ipswich	1837
Bull Motors Ltd., Ipswich	1898

The products of the Group, as will be seen, cover an almost complete range of agricultural implements and machinery, and of other engineering products ranging from a split pin to a bridge.

2. The constituent firms in the Group have for many years had their interests and agencies looked after by merchant houses of first-class standing in India.

3. Individual members of the Boards of Directors of the leading firms in the Group, together with their experts, have visited India and the East, and are fully acquainted with the demands of agriculturalists, not only in India and the East, but in each market of the world.

4. To co-ordinate and assist on the spot, the agents of the various firms in the Group, the parent company recently decided to establish its own organisation and offices in India, and appointed Sir C. E. Low, K.C.I.E., to take charge. This course had been previously adopted with success in the Argentine, and a similar step recently has been taken in South Africa.

I regret that time did not permit of my obtaining Sir C. E. Low's views upon the matters which I later refer to. Sir C. E. Low, K.C.I.E., will have the assistance of a first-class engineer of full and long technical knowledge of the Group's products, who will be sent from here.

5. The Agricultural Engineers' Association (hereinafter described as the Association) consists of over 50 leading engineering firms all for very many years concurrently with, and in competition with my Group actively engaged in the manufacture of agricultural machinery, implements or allied products. The remarks in clauses 2, 3 and 4 apply with equal force to the firms in the Association.

6. The firms constituting both the Group and the Association have at all times shown their willingness to cater for the special requirements of the Indian agriculturalist. Testimony appears in Part 1, Volume 1, of the Royal Commission on Agricultue in India, and special attention is drawn to the very heavy expenditure incurred by Messrs. Ransomes, Sims and Jefferies in this connection. This firm has been associated with the manufacture of ploughs and implements for the Indian market for the last fifty years.

7. The leading firms in the Association and Group have for very many years devoted considerable time and money to research, and to manufacture of machinery and implements particularly suitable to the special demands and requirements of each market. In my address of 5th May, 1927, to the members of the Association on succeeding to the Presidency, I stated:—

> " I view with apprehension the continued and increasing barriers that are being erected, not only on the Continent, but in our Colonies, against the imports of our machines and implements. The action of certain of our Colonies in not only placing heavy and almost prohibitive duties, but also in offering to manufacturers in their protected markets substantial additional advantages by compelling, under penalties, local municipal bodies to place their orders with such home manufacturers is much to be deplored.
>
> Bearing in mind the heavy incidence of taxation and the very heavy sum per head that this country willingly defrays for the defence of our Colonies, the latter should seriously consider what the effect of their policy will ultimately be.

We are asked to buy Dominion fruit and produce. Should we not in turn ask the Colonies to support those who buy from them, by in turn purchasing the machines and implements produced by their best customer, viz., this country? There are not better machines and implements made. The British manufacturer is as willing as any other supplier to give the Dominion buyer the type and design which he has by practice found to be most suitable.

British Empire machines and implements for Empire soils! "

Members of the Group and Association both view with concern the manner of operation of Indian Governments' policy of local preference by Government departments and local authorities, which tends to encourage the production in India of very cheap and inferior implements sold at more than their true value, which while benefiting the local manufacturer is detrimental to both consumer and British manufacturer.

8. The manufacture of agricultural implements and machinery is a highly specialised industry, and the high standard attained has only been accomplished after over a century's practical experience and co-operation between the manufacturer and user, and at very considerable research expense and loss to the former.

To illustrate the difficulties of standardisation of implements, I would point out that for use in different parts of Great Britain and Ireland, a firm within my own Group—Messrs. J. & F. Howard Ltd., still found it necessary after 115 years' experience, to manufacture over 150 different types of ploughs, and an even greater number for the export markets of the world. The following report has been drawn up after consultation with the firms chiefly concerned in the Indian market belonging to both the Group and the Association.

9. British manufacturers have been repeatedly informed by Indian Government agricultural officials and users that implements and machines now supplied by British manufacturers are suitable.

10. Anything more elaborate in design than is at present being offered by British manufacturers would, in our opinion, be beyond the means of all but the large land owners.

The latter are separately catered for.

11. No difficulty exists with regard to production of the required implements by British manufacturers, but if larger orders could be placed, the cost of manufacture could be reduced and the cultivator would reap the benefit. For example, if orders were placed for ten thousand of a type, instead of for hundreds as at present.

12. No difficulty is experenced in finding sound importing agents in India, but the latter have considerable difficulty in finding reliable small up-country distributors, who could be entrusted with small stocks of implements on consignment.

13. The experience of British manufacturers is that different Directors of Agriculture are not in agreement as to types of implements. Promotion or transfer of a Director has shown that a successor holding different views desires costly alterations in design.

The agricultural development of India is severely handicapped through the desire of well-meaning Government officers and others connected with agriculture to invent new types of ploughs—all of which are generally claimed to be superior to other types and likely to sell in tens of thousands. Frequently it is found that similar designs have already been experimented with by the manufacturers and found to be either unsatisfactory or too costly to manufacture for the intended market.

14. Inventors who have had models made in private workshops generally underestimate the actual ultimate cost of practical manufacture, through being unaware of the heavy overhead charges which every modern factory has to meet.

15. The initial order for a new design or type is not infrequently for an insignificant number of newly designed implements and no further orders are received because another officer becomes concerned with the distribution of the implement, and discovers that the merits of the design are over-rated.

16. Makers are then requested to get out revised designs to his idea, and so the process goes on.

17. Agents meanwhile are expected to carry spare parts for the original implements soon to become obsolete, or are condemned for their unprogressive policy if they decline. Spares, etc., of many implements are too complicated to be made in India. Stocking of spares for India is particularly difficult owing to the large variety of designs, and the almost complete absence of any standardisation.

18. It has been reported to one firm in the Association by their Indian agent that in one Province at least, ploughs—copies of British designs on which very large sums of money have been spent by British manufacturers —are being made in the workshop of the Agricultural Department and are being sold in competition with British made ploughs. Reference in this connection is made by the firm concerned to the United Provinces Agricultural Department Report, pages 6 and 7, for year to June, 1926.

19. The same agent points out that the Government department makes no charge for the cost of their services in distributing implements, but that they themselves have to meet such distribution and agency charges.

20. Bearing upon the existing efforts of the Agricultural Department (who are the principal distributors of ploughs) the following figures have been supplied me by a firm in the Association.

INDIA.

1924/1925 *Census of Live Stock.*

Total number of bullocks in India	45,790,000
Total number of male buffaloes in India ...	543,900
Total number of ploughs in India	24,937,000

Ploughs Sold.

	1922–23.	1923–24.	1924–25.
In Punjab	2,683	8,415	5,329
Central Provinces	1,983	7,966	7,672
United Provinces	1,318	1,422	2,633
Madras Provinces	613	1,341	1,834
	6,597	19,144	17,468

The total number of ploughs in use in the four Provinces is 13,364,000.

Without discounting in any way the work of the departments, the results are almost insignificant, and assuming that it is desirable to replace wooden implements with iron or steel ones of improved design, the rate of progress after many years is hardly noticeable.

One difficulty which stands in the way of bringing agricultural implements within reach of agriculturists is " terms of payment."

21. One Indian agent in this connection stated:—" Certain Provinces met their bills within one or two months from date of supply. In other Provinces where arrangements are not made to enable Directors of Agriculture to purchase implements outright and to carry district stocks, conditions of business are that the department should be kept supplied with consignment stock and the goods paid for as taken off by the ultimate buyers. Accounts for comparatively trivial amounts have been outstanding two years after goods supplied."

22. The business in oil engines has been developed on quite a large scale by British makers for many years past because Indian buyers have accepted a comparatively small number of standard makes and designs. Users have, as a result, generally been able to count on an efficient service with regard to selling up the designs and subsequent supplies of spares when required.

23. British boiler makers point out that although special Indian boiler laws exist, there is no official representative in England. Some of the rules and constants in the Indian boiler laws to be applied are left to the discretion of the British designer and maker, who is never certain that his interpretation agrees with the official design. Insurance companies here will give an opinion without responsibility.

To send the design to India and to await the reply would cause such delay as is quite out of the question. It is recommended that an official representative resident in England be appointed to approve such designs and constants.

SUMMARY.

The suggestions offered by the writer in the names of the Group and Association are as follows:—

(1) The task of educating a population of some hundred millions is not one which belongs properly to undertakings run for commercial profit.

Even in advanced countries in Europe and America the necessary mechanical knowledge required to set up a pump or engine is possessed by only a small section of the population.

(2) The only sound method in our opinion of approaching the problem is for the Government agricultural departments to co-operate to the fullest extent with British makers and for the Government of India to extend greater financial assistance to the agricultural departments for this purpose.

(3) As the ryot has no purchasing power, having to support his family, and is frequently in the hands of the money lender, it is suggested that any lien on land should be stopped as in Servia and Russia. In the latter countries a lien can be given by an agriculturist on movable property but not on his land.

(4) If existing social and economic conditions are to continue we also suggest that large landowners should be induced to purchase and place at tenants' disposal a more complete range of cultivating and labour saving machinery the landowner to rely on the greater yield of the crops effected to refund his outlay and still increase his revenue from rent based on a percentage on the total tonnage produced.

(5) An alternative is an entirely new social status by the ryot being backed by Government controlled co-operative societies and land banks, and being placed in a position to purchase up-to-date implements by payment on instalment plan.

(6) The suggested agricultural banks (preferably guaranteed by Government) would arrange loans at reasonable interest rates instead of at twenty per cent. and more, as is now charged by the native money-lender.

(7) If such banks were established with branches in every town, they could advance money not only for the purchase of implements, machines, tools, seeds, etc., but finance sales.

Profits would thus go to the ryot instead of the native money-lender. The final result would be encouragement to produce more and better crops with general benefit to the country.

(8) Actual demonstrations of modern methods and up-to-date machinery should be given by fully qualified demonstrators in every district. Small schools or depots in charge of native instructors in every up-country town are recommended.

(9) Such demonstrations could be given on experimental farms or plots, thus showing in actual demonstration differences in the crops obtained by the new methods as against those on adjoining farms or plots by the old methods.

Mr. G. E. Rowland.

(10) The number of training centres are considered to be too few, and the scope of the educational work done by the agricultural colleges in India could advantageously in our opinion be considerably extended.

(11) Whilst appreciating the difficulties through the great distances to be covered, cheap and quicker transport to main ports is suggested.

(12) The development of irrigation schemes on a large scale by the Government and of smaller installations by private owners is strongly suggested, bearing in mind the very successful schemes already completed.

(13) For cotton cultivation it is felt that there is a need for a machine much heavier and more powerful than the standard tractor. For such cultivation implements would need to be still more robust in construction in order to withstand the heavy stress inseparable from mechanical traction.

(14) The extension to India of the export credits facilities, which have in other markets proved of much benefit to our trade, would assist British manufacturers in catering for this market.

CONCLUSION.

(15) I wish to assure the Commission of the full and active co-operation of the British manufacturers of agricultural implements and machinery in this matter. Certain publicity has been given to unbalanced statements of very general character with regard to the failure of British manufacturers and their agents to make the most of a market of enormous potentiality.

My purpose will be served if my evidence proves to the Commission that British makers are not only fully alive to the possibilities, but that, given the necessary support—financial and otherwise—as is suggested, they can cater for this market as well as they do for the other markets of the world.

The main problem in India being one of distribution, we feel that if development in India is to speedily proceed on a scale commensurate with the immensity of this market it is necessary that the Government agricultural departments shall be provided with adequate grants for financing the purchase from British manufacturers of their implements and machines.

Without this assistance the progress will be slow and take several generations. Meanwhile the British manufacturers' century's practical experience is at your command.

Oral Evidence.

56,131. *The Chairman*: Mr. Rowland, you are Chairman of Agricultural and General Engineers Limited, you are President of the Agricultural Engineers Association, you are Chairman of Messrs. Richard Garrett and Sons, Limited, and you are Chairman of Messrs. James and Frederick Howard, Limited?—That is so.

56,132. Mr. Goodwyn, you are a Director of Messrs. Ransomes, Sims and Jefferies?—(*Mr. Goodwyn*): Yes.

56,133. We have had, as perhaps you know, a certain amount of evidence from various witnesses who dealt with the question of introducing improved agricultural implements into India from various points of view. How long does your experience of this problem go back?—(*Mr. Rowland*): To 1920, but Messrs. Howard's experience dates back a considerable time, in fact to 1813, and Messrs. Garrett celebrate, this next year, their 150th anniversary. The Agricultural and General Engineers Limited was formed in 1919.

56,134. To what extent have the firms with which you are familiar carried out in length of time, and through their own agents, any detailed and technical survey of this problem in India?—I should say for at least fifty years. I am speaking now, not with regard to my own firms, but also for the Association. I should prefer to speak on behalf of the Association.

56,135. In the main, have they depended more upon investigations carried out by their own agents?—Chiefly, with occasional visits from Directors accompanied by their experts.

56,136. Although, to some extent, I take it they have depended upon the advice of officers of the Agricultural Service?—And their own agents on the spot. I may say that I am very largely indebted to Mr. Goodwyn for many of the points in this Report. The investigations which the firms have conducted on the spot have been as thorough and as technical as the investigations devoted to other equally large markets.

56,137. You are satisfied that that side of the work has been thoroughly carried out?—Quite.

56,138. The next stage I take it is, first, the popularising of a particular implement, and thereafter, if the implement is at all complicated, there arises the problem of repairs?—That is so.

56,139. Have you experienced difficulty in reaching the individual cultivator by means of advertisement or selling agencies?—In our opinion, advertisement would not solve the question at all; it must be done purely by demonstration on the lines that we have suggested in this Report. It is altogether too big a market to be dealt with by advertising.

56,140. That is in line with all experience in India?—Yes; that is why (speaking for my own group) we appointed Sir Charles Low now resident on the spot, to keep in touch with the various phases of this matter as they may arise in the future.

56,141. Are you in touch with the provincial agricultural departments?—Through our respective agencies and, we hope, through our own office in Calcutta.

56,142. Have you experience of the hire-purchase system in relation to the improvement of agricultural implements in India?—No.

56,143. Would it be feasible, do you think?—It would be very largely a question of finance.

56,144. But the purchasing power of the individual buyer is usually limited, and his difficulty in finding cash is so considerable that any easement in that direction must be an added attraction from his point of view?—Yes, I am afraid it must come from the State rather than from the manufacturer.

56,145. Why?—It is too big a question of finance, I think, for any one group or firm to handle effectively; it would only just touch the fringe of it.

56,146. Would you care to say anything more about the problem of agencies and repair depots, than you have told us in your Note?—No.

56,147. This Commission is, of course, concerned with the interests of the cultivators in India and it is immaterial to us where he gets his agricultural implements, so long as they are good and are obtained by him as cheaply as possible?—Quite.

56,148. How about production in India in competition with production from overseas? Do you regard yourselves, as manufacturers, as enjoying some particular advantage over manufacturers in India?—I should say the experience gained during a hundred years of practical manufacture in this country would enable us probably to supply the implements that you require, whereas the Indian manufacturer I think, would have to experiment and make the same losses that the British manufacturers have had to face in the same experimental stages.

56,149. You say that, although there is before your mind the completely different conditions existing in India?—Quite; I quite realise we have to overcome the cheap labour and the other advantages which the Indian manufacturer may be deemed to possess, but I think the British manufacturers could meet that competition effectively, provided they were

satisfied that the orders would come in bulk for certain types, instead of in driblets for special types, as at present. I think that is the view of the trade as a whole.

56,150. So much for your alleged advantage in terms of experience: now how about your position on the metallurgical and technical side?—I should say we have an advantage in that respect as well.

56,151. Are you making parts of implements, cutting edges, and things of that sort, and selling those to manufacturers in India, who are building them up into the completed machine?—The experience of Mr. Goodwyn's firm, I think, might be taken as the experience of my group, and I should say of the Association too; they are supplying the metal parts in certain small quantities and they are being made up in India.

56,152. Is that particularly in hardened steel?—(*Mr. Goodwyn*): Yes, and chilled iron; we are supplying complete ploughs, but we also supply the complete sets of metal work for other types.

56,153. Have you anything to say about the railway facilities, afforded or any other points on the distribution side?—(*Mr. Rowland*): I think if it were possible to reduce the cost, it would assist us very much.

56,154. Have your investigations into the requirements of last year's supplies to India brought you to the point where you can fix upon a definite range of types?—Not yet.

56,155. You have not reached that stage?—No; we could, if required, narrow the number of types to a definite number. (*Mr. Goodwyn*): We have been told several times that we have all the types that are required for India; but that of course will be modified by the statement that there are very few types which are within the purchasing power of the ryot.

56,156. And some are outside the pulling power of the bullock?—Yes; what I mean is that the types for India are very very simple.

56,157. I was not concerned to discover whether you had enough types; I was concerned to discover whether you had not too many; whether you have been able to satisfy yourselves that your present state of knowledge may not enable you to narrow the range so as to give you the advantages of mass production?—I do not wish to criticise the agricultural officers, but if they had not asked us to make so many things, and so many modifications of a number of ploughs, there would probably be fewer types. We find that there are a number of different soils in India and they do require different types and different weights of ploughs. The black cotton soils require a much heavier plough than some of the other soils in India; but I think the number of types, if there are more types than are required, is due to the fact that we have been asked to make them. We have always fallen in with the wishes of an agricultural officer to produce a type of plough that he required.

56,158. Has your firm depended more upon the opinion of the agricultural officers than upon the advice of your own agents?—We have been very largely in the hands of the agricultural officers, because it has been mainly through Government institutions, such as grass farms, schools of agriculture, or model farms that the sales have been made, up to the present; therefore, obviously, we have endeavoured to carry out their wishes.

56,159. But your object as manufacturers must be, I take it, to reduce the number of different types as far as possible, so as to increase the numbers of any one plough that you can make, in order to cut down overhead charges?—As agriculture improves in every country, it becomes more difficult to standardise on any particular type; as agriculture becomes more intensive, we find that more designs will be sold concurrently in every country; there is no exception to that in any country of the world. As agriculture improves and becomes more intensive in any country, you will find that the types of ploughs which are used in that country will increase in number. Take a progressive country like the Argentine; twenty years

ago, there were only five types of ploughs sold in the Argentine, to-day there are probably between twenty-five and thirty types. One can never standardise in agriculture. Our efforts, as manufacturers, have always been directed to making exactly the plough that suits the soil, the cultivator, his habits, and his capital. If he is a man of capital, he probably goes in for labour-saving devices with tractors and so on. You can standardise for a few years, and that will probably be advantageous in India, because the ryot will get his ploughs cheaper, and then, as agriculture improves in India, you will start mutiplying again to suit the particular soils and the conditions of the various districts.

56,160. In the class of manufacture in which you gentlemen are engaged, are the advantages of mass production very great?—The advantages of mass production are always very great when you are able to undertake it. I am now speaking for one firm in this Association. We are making somewhere near 350 different types of ploughs to-day; that is to say, we are making an entirely different plough for nearly every country we deal with. There are a number of countries which we simply do not tackle, because it means an entirely new range. Of those 350 types that we are making at present, I should say we are on mass production basis only with about a dozen types. (*Mr. Rowland*): That is borne out by my statement on page 448 of the precis, and I think it is the experience of the trade as a whole.

56,161. Do you view any particular type of agricultural implement or machine in India as offering particularly good prospects to British manufacturers?—(*Mr. Goodwyn*): There are a number of types which are produced exclusively for India, which are sold in certain quantities. I believe that Messrs. Kirloskar Brothers are also producing those types; they were copied really from one of the British manufacturers. There are several types; the type that goes in greater quantities, I believe, is the plough that we have always called the Meston Plough. We still supply a great number of sets of ironwork, but when I speak of a great number, it is a very small number in proportion to the enormous number of cultivators. (*Mr. Rowland*): A similar type of plough is produced by other firms in the Association.

56,162. I take it, Mr. Rowland, that the firms you represent comprise firms engaged in making prime movers for power water lift?—Undoubtedly.

56,163. Do you think that is a direction in which development may be expected? I think so; it is engaging the attention of my group.

56,164. Do you know that the irrigation scheme on the lower regions of the Indus, the Sukkur Barrage Scheme, will mature within a reasonable number of years? Are you taking any particular steps to assay the position there?—I think the appointment of Sir Charles Low is an indication that our interests will be looked after; we have had the privilege of supplying for these other dams quite a considerable quantity of machinery.

56,165. Do any of your large group manufacture any in India?—Not in India. Distinct from my group, Messrs. Marshall do.

56,166. Do you think that practice is likely to increase in the future?—I doubt it very much.

56,167. Would you develop that answer a little?—That matter has already engaged the attention of my group. If we considered the opportunities were favourable, we should certainly go into the matter a bit more than we have done. I think finance enters into that question very largely also.

56,168. At first sight, it appears to offer a possibility of combining the advantages of your experience with cheaper labour and with a readier access to information as to local requirements?—The problem of distribution still remains; I think that is the larger problem.

56,169. Distribution and financing of the purchase?—(*Mr. Rowlands*): Quite.

Messrs. G. E. Rowland and J. A. Goodwyn.

56,170. Both of which are bound to be difficult where you have a large mass of very small cultivators on a very narrow margin of financial power?—Yes.

56,171. Are there any other observations that you would care to make?—The point is purely a technical one and it is rather involved, but the suggestion is that all-steel ploughs should be advocated by Government institutions, by the Agricultural Department. It is a highly technical point, and we should not like to trouble this Commission with two or three hours' address on that point.

56,172. Do you think that heavy power tillage is possible at all except in the case of large estates?—I am afraid not. (*Mr. Goodwyn*): I am afraid, on small holdings, you will find it is a very difficult thing to work it economically, because everybody wants the plant at the same time.

56,173. You mean any system of arrangement or co-operation?—The large estates can make a more economical use of a certain supply of implements for cultivating, whether for power, or animal draught, because a big estate always rings its changes with the crops, so that it will not have to cultivate a large area for one crop at the same time; it makes good use of its implements and machinery all the year round; whereas, on small holdings in any particular district, everybody is growing either rice, or cotton, or something of that sort; they all want the machinery at the same time, so that you require a much bigger sum of money to get the same produce out of the land.

56,174. And you must have elbow room; small fields are against the use of heavy machines?—Yes. With regard to the use of all-steel ploughs, I do not know that we can really put that forward as a recommendation; it is a great advantage if you can introduce them, but with the habits in India of direct yoking of bullocks and so on, it is rather difficult. It is very difficult to get the ryot to change his methods. In most of the small ploughs that are made, instead of making the adjustment with bolts and nuts and that sort of thing, adjustments are usually made by means of a simple wooden wedge hammered in to shift the position of the plough; that is the only thing they can understand. We have endeavoured to introduce a more up-to-date method of adjustment of ploughs for 30 years, but we have made very slow progress, and, even now, some of the most popular types are the very simple ones. Therefore, while I am in complete agreement with Mr. Rowland as to the advantage of eventually adopting all-steel ploughs, I think it is a very difficult matter. (*Mr. Rowland*): It is a matter for 20 years ahead.

56,175. When you are working out the construction of a plough or other instrument of tillage, how do you get the pulling power of an Indian bullock? Do you put it in terms of percentage of horse power in this country, or how do you proceed?—(*Mr. Goodwyn*): If we send an expert out, one of the things he will have to report on in any district he goes to is the size of the bullock, because we have to arrange our catalogues with regard to that. We publish in our catalogue the number of oxen required for each type of plough and implement, based on the average size of animal used in the country in question, then we give a margin of safety. If a plough could be hauled by two large oxen, we should state in this catalogue "two to four oxen required."

56,176. You test the tractive power required for the plough or implement by mechanical means, I suppose?—We very often put a dynamometer on, but we more frequently use a dynamometer for mechanical draught tests, because everybody knows roughly what a bullock can do. If it is found necessary to put four bullocks on, it does not prove anything definite; in certain times of the year a man has to put two or more bullocks on according to the weather, varying conditions to whether the forage is

particularly good at that time of the year; also it is a question of fatigue, and so on.

56,177. Do you regard the Indian market for agricultural implements as likely to be one of increasing importance in the future?—(*Mr. Goodwyn*): I think that very largely depends on the Government; given the organisation, the financing and the distribution, there is no reason why it should not be a very big country for agriculture. I have read very carefully through this book entitled, "Evidence of Officers serving under the Government of India," and it makes me realise the appalling difficulties that officers have to meet to set the country in order; it is going to take a long time. Personally, I think one of the great difficulties is that of the small holdings; I believe India would get on quicker if you could have big estates, and if a large number of ryots who are now working on their own in an unintelligent fashion could work actually for the big landowners. That is true of all small holdings; it does not matter whether it is pre-War or post-War. We have several lessons in the world in regard to that during the post-War period. Take Roumania and the Baltic States; wherever they have split up the land, agriculture is going backwards. The great difficulty in India is going to be to work the great mass of small holdings economically. I think everybody in the Association will agree with me with regard to that. (*Mr. Rowland*): The Association would be in agreement with those views, as well as my own group.

56,178. *Sir Henry Lawrence*: Have you examined the ploughs that are put out by Messrs. Kirloskar Brothers?—(*Mr. Rowland*): Personally, I have not. (*Mr. Goodwyn*): We have; we have had our experts out nearly every year in India.

56,179. What do you consider is the life of a Kirloskar plough as compared with one of yours?—I should not like to say.

56,180. They break much more easily?—I think so. When we make ploughs we have our own metallurgical laboratory and we make shares of various grades of steel, variously tempered for every market in the world. I hope we never shall start manufacturing in India, because we want to manufacture in England; we have our own unemployment and labour questions here; it would be a very expensive matter. Our chemical laboratory is shared by all the departments of our works, and there we are making a great variety of things; but if the organisation in India had to include a laboratory, with the increased salaries that have to be paid for men to live in that climate, we should increase the cost of manufacture enormously as compared with the facilities that we have in this country for highly-skilled labour and highly-skilled foremanship at low prices, and the metallurgical laboratories and that sort of thing, which attend manufacture in this country.

56,181. *Sir Thomas Middleton*: The first point is on the prospects of the Indian trade. When Dr. Voelcker reported on Indian agriculture 35 years ago, and when Professor Wallace visited India about 40 years ago, their conclusions were that there was not likely to be any considerable market for iron implements in India. If you visit India now, you will find thousands of iron implements in many different localities; there has been a remarkable increase in their use in that time. So that in estimating a future market, I think we must regard the experience of the past 35 years as being very satisfactory from the point of view of the implement manufacturer. I recognise that the implement manufacturer has done a great deal of experimenting and been put to a great deal of cost in that time, but the result is that there are now, in India, a far larger number of ploughs, for example, than anyone 35 years ago would have anticipated?—(*Mr. Rowland*): I hope that will be so in another 35 years; I hope the progress will be even greater.

56,182. My point is that I do not think you should be disappointed with the result that has been achieved. Although the effort has been great, a great deal has been done?—We are not disappointed. I should like to say that no statement in this précis is intended as a reflection in that direction at all; but what we feel is this, that the progress can be even greater with the necessary support for which we are asking.

56,183. I think you point out the difficulties that have been caused to manufacturers by the constant change of design by different Directors of Agriculture?—That is so.

56,184. That is the sort of thing you must expect in the development of an industry of this kind; we recognise that difficulties have been placed upon the manufacturers, but if you closely examine the conditions you will see that it is inevitable that there should be these difficulties?—Yes.

56,185. So that I do not think you can complain of the action of the agricultural officers?—We are not endeavouring to do so.

56,186. I rather read into your evidence a suggestion that they were too much given to experimenting with new implements and too much given to troubling the manufacturer with new designs?—(*Mr. Goodwyn*): I should be very glad to remove that impression. Speaking for my own firm, we are very grateful indeed to the agricultural officers; it is mainly through them that we have been able to do what we have done from the point of view of distribution. May I ventilate one point. I have read through this book very carefully, particularly the evidence of Dr. Clouston and other officers and advisers. There is one point that I do not see ventilated: that is the wooden native plough which is made for splitting the soil. In Egypt, as you know, in the big cotton areas they do not plough: they only split the soil with a similar wooden plough of home-made construction.

56,187. *The Chairman*: By ploughing, you mean inverting the soil?—They do not turn the soil over; they simply split it. On the other hand, the big cultivators do plough the land; they plough it fairly deeply and they get a much better yield from that land. I believe I am right in saying this; the fellah in Egypt, if he is going to change over from shallow ploughing to deep ploughing under the Egyptian conditions has to lose one year's crop; that he will not do; therefore he will continue as he has continued for thirty years; we have gone to endless expense in giving demonstrations, in presenting them with ploughs free for thirty years, and we have made no progress at all. In this case it is a question of disturbing the silt and the sand and mixing them; if you plough deep you have to allow time for the sand to settle; that means losing a whole year's crop. Does anything of that description hold the Indian ryot to his simple plough with which he splits the land much in the same way as they do in Egypt. Is there a reason for that, or is it purely that he cannot or will not purchase a better implement?

56,188. Is it your suggestion that in Egypt a whole year's crop would be lost?—I do not like to make that statement quite categorically; I understand that is so in many districts; possibly it depends on the depth of the silt before you reach the sand. In a very large area I believe that is so.

56,189. If you will read our subsequent productions as faithfully as you have the first,* you will see, I hope, a good deal about the relative advantages of splitting and inversion in ploughing?—Did I understand you to say it does?

Yes, to some extent.

56,190. *Sir Thomas Middleton*: The position is this: the Indian plough does the work of a one-time "cultivator." The ryot would like to have both the inverting plough and a cultivator; he must have the cultivator;

* Vol. I, Part I, of this series.

that is the implement that is most useful to him, and usually he cannot afford both. There are certain purposes for which the inverting plough is the better, but he must have the wooden type for stirring his land?—(*Mr. Rowland*): Are you suggesting that we ought to build a combination implement that would do the two things?

56,191. An implement of that sort might be useful?—(*Mr. Goodwyn*): Our experience, generally speaking, is that combination implements are not as a rule very satisfactory. You have so to design them that they can be used for a double purpose and you spoil them for one purpose in trying to make them fulfil the other purpose.

56,192. *The Chairman*: Does it usually mean extra work?—Not necessarily, but it means fittings that are detachable.

56,193. *Sir Thomas Middleton*: The Planet Junior type is very common in many parts of India; that is a combination?—Yes, but that is a cultivator, not a plough.

56,194. There seem to be two things essential: one is getting your right design and the other is facilities for marketing. If you examine these iron implements and machines which have made progress in India, the one which has done best is the small sugar mill. How has that been introduced to the cultivator?—I am afraid I cannot answer that question; we do not make sugar machinery.

56,195. A great deal of work in introducing the small sugar mill was done on the hire purchase system?—(*Mr. Rowland*): Have any British manufacturers made a success of that?

It was handled by British firms.

56,196. *Dr. Hyder*: As regards the difficulties of introducing your implements, do you know how the Singer sewing machine people do hire purchase business with India?—I do not.

56,197. What is the cost of the plough which you send out?—It varies.

56,198. Within what limits?—(*Mr. Goodwyn*): Rs.13 is the price of the simplest implement of all; that is a simple tiny little plough. Of course this type is only for very shallow cultivation. Rs.24 is the price of a good simple plough of medium weight. The hill side ploughs are, of course, more expensive. The best plough for cotton lands has to be a stiffly built plough to stand up to the heavy soil and that costs much more. A plough which could really deal with the black cotton coil of India on sun baked soil costs Rs.90.

56,199. Do you mean to say you could not sell ploughs at those prices and give credit for from three to six months?—There is no difficulty in the willingness of the British manufacturer generally to give credit; anyhow, some of us are willing to give credit.

56,200. I think the Singer sewing machine in India costs about Rs.125, and they are selling these machines on the hire purchase system or by eleven or twelve instalments?—I believe the British manufacturers would be very pleased to consign machinery to a properly organised concern in India, either a Government concern or a company with capital raised in India; supposing you wanted to finance a very big thing in the way of distribution, the British manufacturer would help you by giving you so many months credit.

56,201. What I have in mind is this: you say you have got some kind of an organisation of your own; you consign your ploughs to that organisation and that organisation sees to the spread of that plough in the countryside?—Yes. I think if you are going to sell small ploughs costing thirteen to twenty-four rupees on the instalment system, the whole world's paper supply would be inadequate for your book-keeping records. I do not think the hire purchase system can be adopted for plough implements of small value.

56,202. I think perhaps the Continental people would adopt such a system?—I will not contradict you, but my friend Mr. Caoul, who is here, knows a good deal about selling implements in Siberia hundreds of miles away from the railways, and I think he would probably tell you better than anybody else present about consignments of ploughs to people 300 mile away from the nearest railhead. He knows exactly what the International Harvester Company lost; stocks have been sent to small dealers who are hundreds of miles from the railway, these dealers disappear and nobody has known where they have gone. When it comes to selling, on the hire purchase system, expensive manufactures like threshing machinery sets of the value of £500, it is a very, very different thing, because you are dealing with responsible members of the community when you are dealing with men who can purchase such sets. The hire purchase system is all right for them, but not for the sale of thirteen rupee ploughs; I do not believe it is possible. (*Mr. Rowland*): It is impossible; the cost of distribution would be too great altogether. (Mr. *Goodwyn*): You cannot do the bookkeeping; we can consign to the Government provided the Government will take the financial responsibility.

56,203. *Sir Thomas Middleton*: But why do you take, as an example, your lowest priced plough? Why not think of something that costs more? —Are you going to supply India with expensive ploughs costing forty rupees each, or are you sticking to the simple plough.

56,204. I am suggesting you should not base your estimates on thirteen rupee ploughs?—I should be very glad if every ryot in India would buy a tractor with a small tractor plough.

Sir James MacKenna: The point is, that Singer sewing machines are sold mainly in the towns and not to the cultivators.

56,205. *Dr. Hyder*: You say if the big zamindar farmed on his own account there would be some chance of the introduction of machinery for his estate; is that your idea?—(*Mr. Goodwyn*): I think the remark I made was that I believe it to be a very difficult thing to make a financial success out of agriculture carried on by a mass of smallholders such as you have in India. There is a good deal about education in your first volume of evidence. I believe that until education has gone much further you will not be able to carry on agriculture economically in India. If the Government is going to spend large sums of money on machinery, it would be better if that money were used by people who could manage large estates; and the existing big landowners would do better to carry on large estates rather than rent the land out to thousands of small people, many of whom have plots of land about as big as this room, which is not economical. I do not know that that is possible; if it is not possible, then it is no use putting it forward.

56,206. May I say this to you: you have got to look at the social factors in India: the large zamindar on whom you are relying in the future can have, under his own control, only a small portion of his land as home farm; the rest has got to be given out to the tenants, and therefore this question of small holdings arises?—I think one of the remarks we made in replying to the Questionnaire was that we suggested that progress might be made if the zamindar would purchase, on his own account, large quantities of agricultural machinery and loan it out to his peasants, taking in payment an increased percentage as rental payment, because the peasant would get an increased output with more up-to-date machinery and deeper ploughing; the landowner would therefore get his money back in an increased percentage of the crop which he takes in payment of rent.

56,207. Let us pass to another point. I think you are under the impression that either the Central or Provincial Governments should become actively interested in the sale of machinery. What is your idea? Do you want the Government to buy ploughs from you and sell them out to

the cultivators?—It is hardly for me to express my opinion as to what the Government should or should not do.

56,208. But what is your idea?—We say there has been very great difficulty: manufacturers in this country have taken it up with their agents, and the agents say: we cannot find a sufficiently large number of reliable small up-country dealers to handle this. That is the difficulty. We come back again to the question of distribution; the whole difficulty from the point of view of the British manufacturer is the question of distribution: that and nothing else. We can make anything you like.

56,209. That I understand, but what help could the Government give you? I should like to be clear about the part you want the Government to play in helping in this work of distribution?—In educating and in distribution; but, as far as we are concerned, we are prepared to consign to the Government, to give them time for payment if they want it, but we will not take the financial risk of wholesale distribution in every village in India. For instance, if I were invited, we will say by a group in England, to undertake the actual distribution in every village in India of agricultural implements and take the financial risk, I would not recommend the group to go in for it at present.

56,210. But would you recommend your own group to deal with a body of people organised co-operatively? Is that a sensible and reasonable proposition?—Yes, I think so.

56,211. I gathered, from what you said in the course of your oral evidence, that you had some extraordinary idea about the powers of the Government?—The Government has in the past made grants from time to time in connection with agricultural machinery, not only with reference to its own grass farms, but grants have also been made in all sorts of ways. I mean small grants. I now understand that the Government has in mind doing something on a much bigger scale. I do not know. (*Mr. Rowland*): It has even been suggested that a bounty be given to Indian manufacturers for new and improved implements.

56,212. On page 447 of your note you say: "I view with apprehension the continued and increasing barriers that are being erected, not only on the Continent, but in our Colonies against the imports of our machines and implements." You make a number of complaints there. What is it that the Local or Central Governments do of which you complain?—That speech did not refer to India in particular; actually it referred to Australia; but the Association of which I am President do view the closing or partial closing of certain of our Dominion markets with concern. The reduction of our output can only have one effect, and a very serious effect, upon home agriculture. I am referring to British agriculture.

The Chairman: I am afraid we cannot go into that; we have enough to do in India.

56,213. *Dr. Hyder*: On page 449 of your evidence, item 19, you say: "The same Agent points out that the Government Department makes no charge for the cost of their services in distributing implements, but that they themselves have to meet such distribution and agency charges." What do you mean by distribution costs?—They have their establishment charges to cover, their salesmen.

56,214. You make a distinction later on between your distribution charges and agency charges?—(*Mr. Goodwyn*): I believe what is meant is this. It is a thing which, of course, has been of considerable moment for us. The ploughs that have been sent out from this country have been very largely distributed through the Government farms, the Directors of Agriculture and agricultural officers in India. No Government ever laid itself out to pay a dividend; their services in that way are gratuitous, as it were. I believe it has been usual to add on, in an ordinary way, about five per cent. to the landed cost to cover office expenses of that Government Department, but no profits have been made. Now, in the ordinary commercial way, a firm, an importing company or an Indian

merchant have to market their goods; if they are going to have a lot of up-country agents, spare parts depots, which they must have all over the country, and so on, then it is obvious that if they are going to back up their organisation, send travellers and commercial men round to check the stocks and so on, send demonstrators round to carry out trials, to repair tractors, and anything of that description, then the office expenses will be, absolutely at a minimum, fifteen per cent. Supposing we had endeavoured to create an organisation in India running parallel with the distribution of these ploughs by Government officials, I should have to tell the Government I would not supply them or I have got to go to the Crown Agents for the Colonies and say we cannot sign the usual undertaking that the prices charged are the lowest wholesale terms, because I am going to charge ten per cent. more. You cannot set up a sales organisation, which is a costly matter, concurrently with the Government organisation, because the Government prices would obviously be lower than those that any private concern would be able to offer; and even the co-operative societies would not undertake it when they found themselves being undercut by Government distribution. Commercial organisation is an expensive matter.

56,215. I understand that in the year 1924-25 you supplied 17,000 ploughs?—The British manufacturers between them.

56,216. To that extent, you are on the same footing as those who are selling ploughs made in India; the Government does the same amount of work for you as for other manufacturers? There is no discrimination here?—I believe the Indian officers have always been willing to help those manufacturers who help them; that is to say, if you make what they want for them, they will be very useful. I am not speaking about one firm; any firm which has attempted the Indian market has had that support from Indian officers.

56,217. Could you tell me how many ploughs were sold altogether by your combine, through Government and other agencies?—I could give you my own firm's figures. The following figures extracted from the Agricultural Department's reports will show the number of iron implements sold to agriculturists in the years 1923, 1924 and 1925, by the following four Provinces whose agricultural departments account for 95 per cent. of the sales.* 95 per cent. of these sales have been made through the Government agencies in India.

56,218. *Mr. Calvert*: Government agencies including co-operative societies?—Yes.

56,219. *Sir Henry Lawrence*: You say it has been suggested that a bounty should be given to Indian manufacturers for new and improved implements. By whom was that suggestion made?—(*Mr. Rowland*): May I refer you to Dr. Clouston's evidence at Simla on page 14 and also on page 90, Question 553 of Volume II, Part I.

56,220. By whom was the suggestion made?—By Dr. Clouston in the first place.

56,221. *Dr. Hyder*: You mentioned something about the extension of export credit facilities. What is the system in operation in other parts of the Empire?—You can go to the Government, tell them that you have an opportunity of getting business on certain credit lines; the Govern-

* *Ploughs sold.*

	1922–23.	1920–24.	1924–25.
In the Punjab	2,683	8,415	5,329
„ Central Provinces ...	1,983	7,966	7,672
„ United Provinces ...	1,318	1,422	2,633
„ Madras	613	1,341	1,834
	6,597	19,144	17,468

The total number of ploughs in use in the four Provinces is 13,364,000.

ment will finance up to a certain percentage if they are satisfied that the business can be conducted without risk.

56,222. *Mr. Noyce*: Does that apply to the Dominions or only to Continental countries?—It applies to quite a number of markets.

56,223. To Dominion markets?—Certain Dominions, yes.

56,224. With regard to the question of starting the manufacture of agricultural implements and machinery in India, have not you already got an advantage over the Indian manufacturer in that agricultural implements and machinery are subject to no duty on entry in India, whereas the manufacturer in India has to pay duty on his raw material?—I am not satisfied that that overcomes the difference in the cost of labour.

56,225. You have that advantage?—Yes.

56,226. I take it that neither of you gentlemen has any personal knowledge of the land tenure system in India?—That is a big question and we are very busy men. I should like to know all about it.

56,227. My reason for asking is that you have made a definite suggestion on the point: you suggest that large landowners should be induced to purchase, and place at their tenants' disposal, a more complete range of cultivating labour-saving machinery and recoup the expenditure by increasing the rent?—Yes; that is always on the assumption that it can be done.

56,228. It is only in a comparatively small area in India that the rents are based on produce, that the landlord gets his rent in the shape of a share of the produce, and where the rent is paid in cash, improvements in cultivation do not entitle him to any increased rental?—Is the rent paid in cash?

56,229. Over the greater part of India, yes?—That is news to me; I have always understood that in the majority of cases it was the other way about.

56,230. The Punjab is the only Province in which produce rents are in the majority. Therefore your suggestion is hardly applicable?—No.

56,231. Again, you very strongly support the development of irrigation schemes on a large scale. I take it your suggestion is not based on local knowledge?—(*Mr. Rowland*): No, it is based on the success of the other schemes.

56,232. The Government of India have done an immense amount in the way of irrigation and will doubtless do, in future, all they can in that direction. An Agricultural Engineer who gave evidence before us told us that he considered that three or four types of the various implements were all that were required in India. I take it, from the trend of your evidence to-day, that you would hardly agree with that?—Was he a British manufacturer?

56,233. He was an officer of the Indian Agricultural Department?—Generally speaking, I believe three or four designs might become popular, but it would not meet the difficulties you have to face. That has not been our experience even in Great Britain.

56,234. You mentioned the competition of certain ploughs produced in the Agricultural Departments' workshops, based on copies of British designs. Are there any patents in agricultural implements?—(*Mr. Goodwyn*): There are, but they only last for a limited period. There is no question of bringing out a patent for the Indian plough. It is the simplest thing you can possibly design. There is no question of a patent of any form of plough, unless it is on its particular patented adjustments on the more complicated ploughs, which do not come into the question at all except for tractor work; the only persons who buy them are the big estate owners and Government farms.

56,235. Are not you expecting a lot from the Government when you expect them to send over an official representative here to see that the boilers made in England comply with the Indian boiler law?—(*Mr. Rowland*): I think the Government would recoup that money very soon.

56,236. In what way?—Because, at the present time, manufacturers have to provide in their cost and consequent price against the risk of the design and constants being wrong.

56.237. *Sir James MacKenna*: With reference to the relationship of the agricultural departments to the extension of the use of improved implements, would you prefer that the agricultural departments should confine themselves to experimental examination of implements and propaganda and leave the distribution to the agencies which your firms will be setting up, or for the time being should the present arrangement continue by which the agricultural departments are largely the distributing agencies?—(*Mr. Rowland*): I should think the present system should continue for the time being.

56,238. Is the agency system developed to any extent in your business in India?—Yes.

56,239. I will give you a concrete instance. About twenty years ago, when I was Director of Agriculture, I saw in a local paper an advertisement of local agents for a very big firm of manufacturers in England. I shall not mention their name. I was out to get a very large piece of machinery costing a very considerable sum. I wrote to the Rangoon agent, who referred me to the head office, and the head office referred me back to the Rangoon agent. Of course, no business was done?—(*Mr. Goodwyn*): Most of the English firms have had first-class merchant agents in Calcutta and Bombay for upwards of thirty years; there are quite a number of good merchant firms available for that purpose.

56,240. But do these firms know anything about, or take any particular interest in, the particular agency they have taken on?—(*Mr. Rowland*): If they did not they would lose their agency. (*Mr. Goodwyn*): I believe that the distribution of agricultural machinery has been a very difficult thing. Speaking for my own firm, our agency is held by quite big people whose name would be known to everybody in this room. They cannot see their way to undertaking the distribution of ploughs and implements by the appointment of a very large number of small up-country dealers who would have to hold consignment stocks both of ploughs, implements and spare parts; they cannot do it and they are not prepared to do it. None of them will do it. Probably the best way is that the distribution should go on as it has been done, pending something better being made possible.

56,241. At the present moment, I think, the only large firm of agricultural implement manufacturers who have their own direct representation in India are John Fowler; but then they are dealing with very big machinery?—I believe we have all sent out people to India from time to time. (*Mr. Rowland*): Not only has my group agents of the class mentioned by Mr. Goodwyn, but they have already established their own office in Calcutta and propose to establish other offices for the purpose of liaison with these agencies and the home manufacturer.

56,242. I take it from the evidence and from the appointment of Sir Charles Low that there will be a considerable development?—We are hoping so.

56,243. *Professor Gangulee*: Mr. Rowland, you told us at the beginning of your oral evidence that you have been carrying on a series of investigations through your agencies in India?—Yes.

56,244. I should like to get from you the nature of those investigations?—As to the possibilities of the market, as to the suitability of the implements and machines which we are already manufacturing, or, if we are not manufacturing the type necessary, in fact exploring the market as a whole and its potentialities.

56,245. Have you carried on tests and trials in India with regard to the suitability of farm implements in India?—Yes, tests have been carried out.

56,246. By your agents?—By our agents, yes.

56.247. On your agents' own farms?—Either on their own farms or on farms connected with them.

56,248. Tests something like the dynamometer tests that you carry out in this country?—Yes.

56,249. Are you satisfied that the widest publicity has been given to the tests and results obtained by your agencies?—We hope in the future, anyhow, that we shall have that publicity through the steps we are taking.

56,250. I am interested in agricultural development in India and interested in suitable agricultural implements; but it is very difficult to get data on which one can base conclusions as regards their efficiency?—Quite.

56,251. I am therefore interested to hear from you that you have, in your possession, adequate data relating to agricultural machinery?—I would not say adequate, but we have certain data in certain districts; I am not satisfied that we have sufficient. (*Mr. Goodwyn*): A great number of demonstrations have been carried out; we have spent a considerable sum of money, we have given a very great number of demonstrations in India.

56,252. Demonstrations by your agents?—No, demonstrations by our agents and by our own expert from England; the demonstrations have been given sometimes at Government farms, sometimes at Poona and Pusa and so forth; but very frequently we have received the reports back from our people to the effect that it hardly seems worth the trouble; the only people at the demonstrations were British officers; there were very few Indian cultivators attending the trial. I believe that was partly due to the Indian cultivator taking the line: "This is all very well at the Government farm; they have got plenty of money; they can buy this, that and the other; we are poor men, we cannot buy these things; what is the use of going to see them." I know that in some of these demonstrations there was the expense of getting the machinery there, sending expert mechanics out from England, going to the whole way round India, travelling these ploughs about, leaving them in stock, and so on; we spent hundreds of pounds on a single demonstration, and it has done very little good at all, it is money out of pocket. When I say it has been no good at all, of course one never knows; it is just the same as newspaper advertising: you cannot tell; you do not get direct enquiries immediately after you have advertised; it may do good in the future; but I would say this, that demonstrations have been extraordinarily discouraging.

56,253. Have you carried out demonstrations on the farmers' own land?—That has not been so easy; on a few bigger estates we have, but I believe the great majority of the demonstrations have been carried out by agricultural officers, or rather with their co-operation, at Poona and Pusa and other similar establishments.

56,254. On the question of demonstration, we had a very interesting note* from Messrs. Duncan Stratton & Company; I think they are your agents?—They have been our agents in Bombay for over thirty years.

56,255. They told us: "I do not think that demonstrations carry much weight; at most of these there is an expert at the plough; it is his skill rather than the excellence of the plough which is demonstrated." Have you any views on that?—I do not know that I quite make that criticism; but, of course, Messrs. Duncan Stratton's criticism ought to be taken seriously, because Mr. Edward and Mr. Frank Harwood have put a considerable amount of their personal time into following up these demonstrations and attending them; therefore I should not like to criticise any remark they made, because they have the experience.

56,256. Harking back to your investigation work: have you in your possession data showing the comparative efficiency tests between the country plough and the plough you want to introduce?—(*Mr. Rowland*): To a certain extent, yes.

56,257. Do you work out, for instance, the cost involved in using your plough, as compared with the plough used by the cultivator?—We have an approximate idea, yes.

* Not printed.

56,258. And of the yield resulting from the use of your plough and that resulting from the cultivator's own plough?—Fairly approximately, yes.

56,259. I suggest that these data are necessary before you can push certain implements on?—I am not so much concerned with the pushing of any one kind of implements as I am with pushing British implements.

56,260. Any implement for that matter?—I am looking at it really from the point of view of the British manufacturers as a whole.

56,261. What led your firm to form this new organisation that you propose to establish? What is the idea behind it?—We are not satisfied that we are doing sufficient business in India, and, without interfering with our existing agencies, we wanted some one on the spot who would be virtually one of ourselves and in a position to deal with any problem on any point which arose.

56,262. The object of this organisation will be to keep in touch with the Government agricultural departments, other existing agencies and the cultivator?—Yes.

56,263. You will have a central office?—In Calcutta, yes.

56,264. And your own experts?—Yes, we shall have our experts.

56,265. And your own firm to test your implements?—That will probably follow later.

56,266. You are not quite satisfied with the information which you have received from the agricultural departments and your agencies; that led you to establish this new organisation?—I do not say that.

56,267. What is, then, the idea of the new organisation?—We were not satisfied with the amount of business done.

56,268. With regard to the question of standardisation you referred to the Argentine cultivation; is the multiplicity of types due to soil variations?—(*Mr. Goodwyn*): Yes, and more intensive cultivation. What I mean is that as agriculture goes on and time goes on, ploughs change in types. For instance, to take a country where virgin soil has possibly been broken up mainly by disc ploughs, farmers eventually adopt the mould board plough. When they come to the mould board plough they have probably got to have three or four different types of mould board plough of different weights to suit various climates. One of the most interesting instances of that is Algeria. That is also a country where Mahummadans are doing the cultivation. In Algeria if they get early rains the light plough is sold there, but if they do not get the rains until late in the season, they want ploughs of about twice the weight in all the different types that are used there. That is to say, it is not only a question of intensive cultivation; it very much depends upon climatic conditions, which vary from year to year.

56,269. The question of standardisation is an important one. We are told by another firm in India that standardisation of designs is a matter of considerable importance and the standardisation of implements and spare parts would do much to popularise their adoption. What are the precise difficulties in the way of standardisation of certain types?—We have no difficulty; we should be only too delighted. We propose to go on; our suggestion for the moment was that you could not do better than distribute through agricultural officers. Most of the variations and the new types, or the modifications of old types, have been at the suggestion or at the request of agricultural officers. We have from time to time pointed out, of course, that if you modify this plough you are going to alter all the spare parts. Then we make a plough to the design of a particular officer and he is changed, we will say, from Pusa to Madras, the following year; his successor does not approve of that particular type. Of course, you must carry out what the new Director wants, and we have always done so. We are then landed with a new type and have an order for two or three hundreds; we cannot expect your agent to keep spares for a type which has become obsolete within a few months. That is a difficulty we have been up against for years in

India. I do not want to criticise the agricultural officers at all, but those are the circumstances which make things difficult.

56,270. Would you like to see a central experimental station in India where this problem of standardisation and all problems connected with agricultural implements and machinery would be undertaken?—We believe it would spoil any chance of ever making any progress in India. I will state that very definitely.—(*Mr. Rowland*): Yes, that is my view.

56,271. Then you might get adequate information from the agricultural departments?—(*Mr. Goodwyn*): Ploughs are not designed by Governments; ploughs are designed by manufacturers like ourselves who have been doing it for 130 years. It is obvious that a lot of good has been done by agricultural officers in India, but we do not want any assistance in designing ploughs; we will make what the agriculturists want. In every country we do it; that is what we live on.

56,272. Design depends on agricultural data?—We can settle those data with our own experts. If you call Government experts in, experts who change from time to time, the result will be a variety of opinions which it is impossible to deal with; you will never standardise by those methods.

56,273. Supposing you had a number of Government experts who were to be definitely engaged in agricultural engineering investigations, could not you get continuity of work then?—If you ask my opinion, I am very much against any centralisation of experimental departments where ploughs shall be decided upon by a Government. You cannot do it.

56,274. You would leave that to the trade?—Leave it to the trade and to the agriculturist; if the manufacturer does not make what the agriculturist of the district wants, then he does not get the trade.

56,275. Do you want any assistance from the Agricultural Department to test your ploughs?—No, we do our own testing. For instance, if we are sending a representative out to India and he is a commercial man, we do not trust him to make a test of a plough. We send out our own experts who have been born and bred in it. A man who has been through a University and read a tremendous amount about agriculture may be a good theoretical man, but he is not often a plough expert.

56,276. What would be the relation of your proposed organisation with the departments of agriculture in India?—To work in co-operation, but I think you must leave the design to the experts, that is the manufacturers.

56,277. You rightly tell us that the main problem of India is one of distribution, and therefore you suggest that the Government agricultural departments should provide grants. We were told by Messrs. Duncan Stratton & Company that they endeavoured for some years to sell their implements through agricultural departments by placing these implements on consignment basis with several agricultural departments in the country; this arrangement does not appear to have met with any success. Can you explain why that is so?—It is a very difficult matter. I think really the whole reason for the slow progress is the very small purchasing power of the ryot.

Mr. Kamat: That is exactly the whole point.

56,278. The purchasing power of the Moroccan peasant is certainly not greater than that of the Indian peasant?—I come back to my point: in Morocco there are big landowners; the Moors are big landowners. In Algeria there are big French Colonial landowners and there are the Arab landowners. The same is true in Tunis.

56,279. Have you had business in Egypt?—We have a business in Egypt, yes.

56,280. Do you find any difficulty there in introducing your implements? —For ploughs very great difficulty, because they do not use ploughs; they split the land generally. But threshing machinery is in demand, and for oil engines for irrigation it is the biggest market in the world.

56,281. Could you tell us what arrangements you enter into with the Egyptian cultivator? His purchasing power is surely not more than the purchasing power of the Indian peasant?—I believe, in a very large number of cases, one of the bigger men in a district puts down an irrigation plant, we will say, with a 100 horsepower engine and a pump, and he charges so much for helping all his neighbours. I think that is the system under which it works generally in Egypt.

56,282. Do you deal in cream separators or dairy appliances?—I believe, in the combine, there are firms who do. (*Mr. Rowland*): One firm in the Association reported as follows:—"Cream separators. Usually the milk supply is very poor owing to the low grade of cattle; an average full sized cow is about the same size as an English calf. There is no cream to separate, and if separated there would be no market, and, owing to the climate, it would be liable to go bad before it could reach the larger towns."

56,283. So that there is not much scope?—Not very much.

56,284. *Mr. Calvert*: In the evidence given to-day, a great deal has been said which I do not think is quite correct. I have been wondering whether your difficulty really is, not as you think of distribution, nor anything to do with the plough, but whether you, in designing these implements, have forgotten the incidental points; that is to say, the handiness of an implement to get round a right angle corner with only about three or four inches separating one man's property from that of another. The other thing is that an Indian cultivator, certainly in the Punjab, does not like nuts and screws. Is it possible to design a plough which could have the point renewed without nuts and screws?—(*Mr. Goodwyn*): Yes, that is how we are making them. I have explained that already. With regard to corners, we make the simple ploughs right and left handed, so that in varying districts some of these ploughs will turn to the right and others will turn to the left. India is the only country for which we have to build ploughs right and left handed to suit the habits of the natives.

56,285. We have established agencies all over the Punjab and put these ploughs in front of the cultivator, but he will not use them (*a*) because of nuts and screws, and (*b*) because he likes, at the end of his day's work, to drag his plough along the ground to his hut; but your steel ploughs break if they are dragged along the ground. He drags the wooden part of the local plough along the ground and no harm is done?—We have made ploughs for Greece of a weight suitable for a man to carry on his back, because as a rule he is borrowing a mule; he takes the mule back to its owners; he dare not leave the plough in the field, and he carries it home on his back. That is what regulates the weight of the plough. The Indian ploughs are, many of them, lighter than the plough for Greece. We will make anything you want; if you will criticise us and give us the right criticism you can have anything you like; but will the next man agree with you? That is the trouble.

56,286. You did give an answer to one of my colleagues that you would like the Agricultural Department to go on establishing agencies and selling these ploughs?—No, not establishing agencies; we have our own agencies. We will supply all our manufactures through our agencies. The Government schools and farms and all the Government institutions order through our agencies. We do not ship to the Government; we ship to our agents.

56,287. I was thinking of agencies in the villages. Have you not reported that one of the big obstacles to the sale of these ploughs in the villages through co-operative agencies is that the co-operative agency has to pay the cost of distribution and the Government departments have not, so that your Government departments can under-sell the co-operative agencies established through your own travellers?—I think that is obvious. After all, a good administration with its depots of spares must cost more than a Government department distributing when the Government department is not out to make a profit. And, of course, the Government has never

pretended that it is undertaking the complete distribution of ploughs to India; it is only to people who are near the schools or who may get in touch with the Director of Agriculture and say: "Here are a dozen ryots in the place; will you send them a dozen ploughs"? But there has been no proper organised distribution of any description. When I say organised, I mean complete with its depots of spare parts in every district.

56,288. There have been great efforts? There have been heavy monetary losses in trying to establish such distribution?—One of the witnesses, as appears in this book, said that one of the reasons why the co-operative societies had not made the progress that they should have made was because the moneylender always comes along and prevents the ryot going to the co-operative stores. I suppose that is due to some more tempting offer for the moment. That is a rather interesting piece of evidence. I should think that has probably had something to do with the co-operative stores not having taken such a prominent part in the past as they should have done.

56,289. You are dealing with a market for 24,000,000 ploughs?—Yes.

56,290. I think you mentioned that out of the number of types of ploughs you are making, only about fifteen types are on a mass production basis. Is it fair to ask you roughly what you mean by a mass production basis?—Firstly, manufacture on a mass production basis may be undertaken, when orders are in sufficient quantities to warrant the capital outlay of jigs, dies and automatic labour saving machinery, by which means the cost of assembly is avoided; the various units only are fitted and assembled, dipped in paint bath and then packed for export. To ensure interchangeability careful inspection is necessary and from time to time a complete assembly of the plough, implement or machine is made from parts in progress. Secondly, you cannot mass-produce economically if you are faced with having to produce a small quantity only of drop-hammer forgings; again you cannot purchase steel sections economically unless you are prepared to give the steel makers orders for not less than 5,000 pieces of the same pattern.

56,291. *Mr. Kamat*: Mr. Rowland, on page 448 of your memorandum you say: "Members of the Group and Association both view with concern the manner of operation of Indian Government's policy of local preference by Government departments and local authorities, which tends to encourage the production in India of very cheap and inferior implements sold at more than their true value, which while benefiting the local manufacturer is detrimental to both consumer and British manufacturer." From the point of view of the British manufacturer this may be perfectly right, but I will just ask you to look at it from the point of view of the Indian Government and the Indian taxpayer. Do you mean that when the Indian Government or the local consumer gets either American or British articles or Indian-made articles, the policy of the Government of India, as officially laid down, should be that local agricultural departments should encourage only British manufacture?—(*Mr. Rowland*): No.

56,292. You do not seriously mean to say that?—No; but assuming that the British manufacturer can, as we maintain, give better value and workmanship, we suggest that the British manufacturer should have the preference.

56,293. The Government of India, after a good deal of consideration, have laid down their policy in the Stores Purchase Rules to which Mr Pitkeathly has referred?—Quite.

56,294. His department has discretion to consider quality for quality, price for price and all the other factors?—Yes.

56,295. Do you mean to say that that policy, as laid down by the Government of India, is faulty if, after due consideration of the quality and price, the Indian article is encouraged?—It evidently has not been very successful because of the references in this book to the number of appliances that have failed; there are distinct statements here that many appliances have failed and a bonus for very good implements is suggested. There is another reference that it does not pay to manufacture on a large scale in India.

56,296. That may be perfectly correct from the British manufacturer's point of view, but do you mean to say this Commission should call in question the policy laid down by the Government of India after full consideration?—I do not say that at all. I simply say we view it with concern. The policy may be quite right; we are looking at it from the point of view of its effect on us.

56,297. On page 451 you say: "The main problem in India being one of distribution, we feel that if development in India is to speedily proceed on a scale commensurate with the immensity of this market, it is necessary that the Government Agricultural Department shall be provided with adequate grants for financing the purchase from British manufacturers of their implements and machines." Here, again, do you expect the Government of India to finance the purchase of British manufactures when they have three or four different manufactures coming into the country?—The experiences of British manufacturers who specially catered for this market have not been particularly fortunate, inasmuch as one firm in particular, after spending a considerable sum on the development of this market, have found that their implements and research and experience which they put into the working of this market have come to nothing through being copied by the home manufacturer.

56,298. *The Chairman*: Being copied?—Yes.

56,299. In breach of patent rights?—No, I do not say that. There is not, on a simple plough, anything which you can patent; it is simply the experience which enables you to judge which is the right appliance to use.

56,300. *Mr. Kamat*: The Government of India or Local Governments give financial assistance; they give *taccavi* for the purchase of implements by the cultivator and then leave the cultivator to choose his own manufacturer; whether British or American, it does not matter which to the Government of India or the Local Government?—Quite.

56,301. Is not that quite adequate? Do not you think that is the right policy?—They have not made much use of that up to now, if these figures that are given are correct.

56,302. What I am trying to point out is that the Local Government or the Director of Agriculture concerned has this difficulty: he cannot either on his own demonstration farm or on his experimental farm, dictate to the cultivator that the British manufacture should be chosen by him; is not that quite a fair attitude for any Director of Agriculture to take up?—(*Mr. Goodwyn*): I think it has been a matter of price, mainly, that has persuaded the cultivator to buy the Indian-made plough.

56,303. Taking human nature as you know it, either in this country or anywhere, do you think any Director of Agriculture can induce a cultivator, when he can get a particular plough, say, for Rs.40, to reject that and go in for a plough which costs, say, Rs.60?—I do not think we are expecting that. Our feeling is that if the Government of India are going to make a big plunge with regard to agriculture in India, then it will probably mean an increased purchase of a considerable range of machinery: implements, ploughs, oil engines, pumps, &c., &c. The balance of trade cannot, in this world, all be on one side. Do you expect to make things for yourselves and sell also everything you produce in the country? You will get wrong with your finances, will you not? Would not it be better for you to purchase certain things in England and sell England your produce, and not do all the selling and making. If the Government said to Messrs. Kirloskar Brothers: "You have got to make certain machines," there are certain machines which Kirloskar could well make. There are other implements, however, which it probably would not suit Kirloskar Brothers to make with such labour as they have at their disposal. There is no reason why some kind of combination should not arise out of this,

whereby the aspiration of the Indian manufacturers would not be prejudiced and the British manufacturer would still have a reasonable share of this very important trade.

56,304. Certainly, there are certain implements such as these which you have referred to, e.g., potato diggers, which you can really push on the Indian market, because they seem to be extremely suitable, but are you carrying on sufficient propaganda for that business?—The propaganda is entirely a question of the customers; it depends whether you have got literate customers or not. In Russia all the propaganda we did was with show cards at the stations with pictures of threshing machines, etc. What do you mean by propaganda in India?

56,305. I have here one or two catalogues of your manufacturers. I have looked into them, and, as far as I can see from this paper, there is a machine called a potato digger; I think that is very little known in India and it could be pushed by effective propaganda through the agricultural departments or through your agents?—Some of the firms have got them.

56,306. Here is a line which you can really push without coming into conflict with anybody?—(*Mr. Rowland*): That is being done through Messrs. James and Frederick Howard, as a matter of fact. I happen to be Chairman of Messrs. Howards.

That will leave elbow room for both Indian and British manufacturers, and your difficulty, I hope, will be partially solved.

56,307. *The Chairman*: Who are your most formidable competitors in India: manufacturers of agricultural implements in India or manufacturers of agricultural implements in America and other foreign countries?—I should say the home manufacturer; American competition is comparatively small in implements, small ploughs and small cultivating machinery. In harvesting machinery, the competition is American.

56,308. And in prime movers?—To a certain extent the Americans.

56,309. *Mr. Kamat*: Do you mean that as regards prime movers you are holding your ground against the American competition?—No.

56,310. *Sir Henry Lawrence*: What about German competition?—I believe the German competition is stronger than the American with regard to prime movers.

56,311. *Sir Thomas Middleton*: In explaining to you the reason why the Indian cultivator adhered to his wooden plough and did not buy a second, I do not want you to suppose that there is not a large potential market in India for the iron plough; I think I made that clear?—(*Mr. Goodwyn*): Yes.

56,312. What I was thinking of was that we have in India something like 30,000,000 to 40,000,000 ploughs in use, and the great majority of those will for many years to come be wooden ploughs; but there is a big potential market for the iron implement?—Were you referring to an entirely wooden plough or simply a steel mould board and share with wooden handles and beams?

56,313. I was referring to the country plough entirely wooden except for a pointed tine?—I have not, at any time this morning, been referring to an entirely wooden plough.

56,314. You were referring to the stirring implements; you asked whether a stirring implement or an inverting implement was wanted?—Yes, my mind then was running on the Egyptian reasons for wishing to stick to the native entirely-wooden implement.

56,315. Any inversion implement which comes into India must displace the original implement?—Yes.

56,316. The displacement costs money; if you take the 30,000,000 to 40,000,000 users of wooden ploughs in India, relatively there are not many among them who can afford to have two implements; that is, there is not a large percentage, but if you take the actual number who could and would

employ the inversion plough, it is very large. A very small percentage of 40,000,000 makes a big order for ploughs?—Yes.

56,317. *Sir Henry Lawrence*: You have no suggestion to make with regard to competition with countries with depreciated currencies?—I do not quite follow you.

56,318. There is a growing competition, is there not, of German implements; is that in any way favoured by their depreciated currency?—They have got a gold currency now; but, of course, at some post-War periods, particularly in 1921, 1922 and 1923, before their gold currency came along, when they had a depreciated currency, it did act against the interests of British manufacturers very severely in certain continental countries where we had business, but not to any great extent in the Colonies and British Dependencies.

56,319. There is no other country with a depreciated currency with which you are in competition?—There is Czechoslovakia, which is our most serious continental competitor in implements to-day, I think.

(*The witnesses withdrew.*)

Mr. F. C. O. SPEYER, General Manager, Nitram, Limited, and British Sulphate of Ammonia Federation, Limited.

NOTE OF EVIDENCE.

1. In a memorandum dated August 30th, 1926, copy of which I attach,* I attempted to give a general account of the scope and aims of the work we have undertaken in India with a view to creating and increasing the demand for artificial fertilisers.

2. The information contained in that memorandum has since been supplemented by the evidence given before the Royal Commission in India by Mr. C. M. Hutchinson and Mr. F. E. Maurer.† A copy of this evidence was sent to me at the time by these witnesses. I may perhaps remind the members of the Commission that Mr. Hutchinson has been appointed Chief Scientific Adviser to Fertiliser Propaganda of India Ltd., a company created by Nitram to popularise artificial fertilisers in India, and that Mr. Maurer represents Messrs. Shaw Wallace and Co., who form part of Nitram's selling organisation in India.

3. The statements above named deal with the main commercial and scientific aspects of the problem and emphasise that:—

(*a*) The agricultural problem cannot be dealt with from the point of view of one factor alone, better agricultural education, better seed, better methods of cultivation, larger supplies of cheaper fertiliser, larger water supplies, must all play their part.

(*b*) The progress made in providing better seed and in improving methods and implements of cultivation is already calling forth an increased demand for fertilisers to replace the increased quantities of plant-food removed from the soil in the larger crop-yields.

(*c*) Both scientific research and scientific experiments and ocular demonstrations on a large scale are required to provide information as to the effect of fertilisers, which is at present far from complete.

(*d*) The agricultural departments throughout India must be provided with larger financial resources if they are to carry out, on an adequate scale, the researches in regard to the effects of fertilisers which are the essential basis of sound propaganda.

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* See page 477.

† See volume iv (Bengal), pages 302-318.

(*e*) While the value of artificial fertilisers is appreciated in the plantations, only a small beginning has been made in inducing the ryot to use them. They are at present being used by ryots mainly for sugarcane and irrigated cotton.

(*f*) The economic factor is of prime importance. The ryot can only be expected to adventure expenditure on fertiliser if there is a very wide margin between the cost of the fertiliser and the average return in increased yields which he obtains over a series of years. This margin exists in European countries to-day.

(*g*) As the agricultural and economic conditions in India under which it is safe to recommend the use of artificial fertilisers come to be better understood, there is every reason to anticipate an enormous demand for artificial fertilisers.

(*h*) Availability of supplies, economical methods of distribution, cost of transport and provision of credit facilities are also important factors. The practice of the Egyptian Government is cited.

(*i*) Effective collaboration between the agricultural departments and the fertiliser industry is required.

4. I now wish to deal more in detail with some of these points, with a view to putting forward definite proposals.

The Royal Commission will no doubt wish to have information as to (i) the means by which we propose to carry our proposals into effect and (ii) the experience on which we base them.

(i) Nitram Limited, although a separate company in form, acts primarily as the joint selling department for all forms of nitrogenous and other fertilisers produced by British Sulphate of Ammonia Federation Limited (representing 92 per cent. of the production of sulphate of ammonia in Great Britain and India) and by Brunner, Mond & Co.'s subsidiary Synthetic Ammonia & Nitrates Ltd. Brunner, Mond & Co. have, in turn, been merged in Imperial Chemical Industries Ltd., a company with a capital of £65,000,000. I am authorised to state that Imperial Chemical Industries approve of the proposals I am about to put forward, and are prepared to enable Nitram Ltd. to carry them out.

Owing to its friendly relations with continental groups of makers of fertilisers, Nitram is in a position to sell a number of new fertilisers which its own producers are not yet, but will shortly, be making.

(ii) Our experience of agricultural propaganda work extends over a period of over 29 years. At the outset, its sole object was to increase the use of sulphate of ammonia at home and abroad, and partly as a result of this work (though partly also due to conditions during the War), the consumption at home has risen from about 50,000 tons before the War to 170,000 per annum now. We have, at the same time, co-operated with foreign groups in propaganda, and these joint efforts have played an important part in raising the consumption of sulphate of ammonia in the world from about 1,200,000 tons in 1913 to over 3,000,000 tons per annum to-day.

Although we have been principally interested in sulphate of ammonia, we have always advocated the use of phosphates, potash and lime and, in recent years, we have broadened the basis of our work to include all economic forms of nitrogen.

Our propaganda work has, in the past, been based and must continue to be based on the results of experiments carried out by official institutions. We have supported experiments at such institutions by grants in money and in kind and we propose to continue to do so.

As examples, I may cite contributions to Rothamsted and to agricultural colleges at Home, and to several of the Chinese Universities and the Palestine Government abroad.

A similar policy has been pursued in getting trials carried out in Spain, Canary Islands, Italy, Egypt, Canada, Kenya, Nyasaland, South Africa, Sierra Leone, Java and the Malay States.

For ocular demonstrations and personal contact with farmers, we rely on a staff of about 15 to 20 qualified agricultural advisers at home, and on European and native advisers in the overseas countries named.

Latterly, with the advent of many new forms of fertiliser and the possibility of making them ourselves, Nitram, with the active support of Imperial Chemical Industries, has found it necessary largely to extend its research and advisory department, and while continuing to look to research institutions for advice and information on research problems, it has established a research station and experimental farm of its own near Wargrave. The names of the Director and the Scientific Officers responsible for this work of agricultural research are set out at the end of this note.

These facts are mentioned in order to show that, although located in England, the function of the Agricultural Research Department of Nitram is to promote and undertake research, experiment and trial in the use of fertilisers throughout the Empire and in other parts of the world. The home staff is available for the investigation of all problems in connection with fertilisers both at home and abroad.

Our total expenditure on agricultural research and propaganda is now upwards of £100,000 per annum. Of this we are at present spending about £23,000-£26,000 per annum in India.

This total sum is allocated approximately as follows at the moment:—

	Per cent.
Expenses of head office at Calcutta and branch offices at Madras and Bombay, including European and Indian establishment and travelling expenses	33
Advertising and literature	8
Advisory and demonstrational work carried out mainly by Indian staff, including fertilisers for experiments, and conduct of experiments	59

The total Indian staff at present employed is about 109.

5. Our general method of approach to the cultivator in India is the following. Aided by the knowledge based on local conditions, supplied by the local Agricultural Department, we arrange experiments and demonstrations by means of our Indian agricultural advisers. They choose the best cultivator in the village and try to induce him to allow a demonstration to be made on his land.

Successful demonstration is followed by the establishment of a selling depot in the village. The native agricultural advisers then canvas the village or district intensively and tell the cultivator he can get supplies from the store.

The price at the store is a fixed price for cash or for credit, and we control the extras charged by the depot agent or storekeeper when he sells on credit. The depot agent receives a commission for selling.

We realise the absolute necessity of supplying the ryot at the lowest price possible, whether he pays cash or requires credit, and our method of selling aims at the elimination of all unnecessary middlemen and expenses.

This system of selling has already been remarkably successful as regards the sale of soda ash and other derivatives of ammonia and soda in India, and Brunner, Mond and Co. (India), Ltd., who also form part of our retail selling organisation for fertilisers, have increased the sales of ammonia soda products from 36,000 tons in 1922 to 52,000 tons in 1926.

Indo-Agri Ltd., another retail selling organisation formed by Shaw Wallace and Co., works on a slightly different principle of a fixed profit per ton and fixed allowances to depot agents.

Between them the two retail organisations have working about 156 depots situated in the following spheres:—

	Depots.
Calcutta sphere comprising Bengal, Bihar and Orissa, Central Provinces and United Provinces	98
Bombay sphere	28
Madras sphere	30

A further Karachi sphere is in process of creation.

It is our intention to conduct the sale of our fertilisers in India, both wholesale and retail, by the most economical methods possible and not to attempt to make any profit on the distribution. We propose to adopt as a general principle that our agents or organisations should work for a moderate percentage selling commission, so that they have every incentive to develop sales.

Nitram itself makes no profit on the sale of the sulphate of ammonia made by its producers.

The manufacturing profits of those producers, including Synthetic Ammonia and Nitrates Ltd., are limited by the fact that we are only one among many fertiliser-producing groups in the world.

Our selling organisations are prepared to sell any fertilisers of which the agricultural departments approve, and our Research Department is already engaged in testing the suitability, for Indian conditions, of certain of the new combined fertilisers recently put on the market.

6. The rate of progress of our work in India must depend on adequate knowledge and adequate means for its dissemination. For the latter purpose trained native advisers are essential, but we have, so far, been unable to obtain a sufficient number of them.

To meet this want, we have just set up a training centre of our own at Tollygunge.

We feel that the need for fuller information can only be supplied by close co-operation between the various agricultural departments *inter se* on the one hand, and by their co-operation with the fertiliser industry on the other.

We believe that the cumulative effect of such co-operation would be greatly in excess of the sum of individual efforts by individual departments or firms, bearing specially in mind that the magnitude of the problem is largely due to the vastness of the country.

I have shown above that we are actually spending a sum of money, large in itself, but small when compared with the requirements of India.

We put forward the following proposal as an illustration of the means which we think might be employed to secure the co-operation to which we have referred above. If some such proposal is adopted on lines with which we are in sympathy, we are prepared very considerably to increase our allocation of funds for fertiliser propaganda in India.

7. We suggest that Government should establish a Central Fertiliser Office on which would be represented the Central Government Agricultural Department, the Provincial Agricultural Departments, and also Nitram Ltd. and any other important fertiliser interests. We wish to make it clear that we seek no monopoly and that we are prepared to co-operate with bodies representing any other fertilisers likely to be useful.

Mr. F. C. O. Speyer.

The functions of this office would be:—

(*a*) To serve as a clearing house for the collection and dissemination of all information, on fertilisers and their use, which was likely to be useful in India. This information would be contributed primarily from Indian sources, but information from other countries would also be circulated.*

(*b*) To recommend lines of research to be undertaken either by central or provincial research stations.

(*c*) To recommend standard methods for the carrying out of scientific agricultural experiments and for recording results.

(*d*) To give careful consideration and to make recommendations as to the most suitable form or forms in which information in regard to fertilisers should be published. Responsibility for publication might rest with the Central Fertiliser Office itself or might be provided for by grants from the Central Office to the Provincial Agricultural Departments.

(*e*) To remove one of the chief impediments to progress, namely the lack of co-operation between the agricultural departments and the fertiliser trade.

The Central Fertiliser Office should be under the charge of a first rate Scientific Officer, to be appointed by Government, who would devote his whole time to the work of the office and be given such clerical and other assistance as was required.

8. If the Government so desires, part of the contribution from us, referred to below, might be used towards the establishment and maintenance of the Central Fertiliser Office, but we think that contributions from us would be more suitably devoted to assisting to finance schemes of research and experiment recommended by the Central Office.

9. Besides the establishment of the Central Office, we contemplate provision, on the largest possible scale, for simple experiments and demonstrations on the use of fertilisers which experience has already shown to be of value in increasing crop production, and we also propose to institute trials of a somewhat more elaborate nature, the results of which should provide information not yet available as to the use of fertilisers.

These activities would, of course, be crowned by the pure research work undertaken by the various Provincial Agricultural Departments in India.

If the principles underlying these proposals were adopted by the Government, we should be prepared substantially to increase our expenditure in promoting the knowledge and use of fertilisers in India, and I am authorised by Imperial Chemical Industries to state that we would be willing to contribute on a £ for £ basis to agreed schemes until our total expenditure for propaganda in India reached £50,000 per annum, provided that similar sums were forthcoming from other sources. We would propose to continue our own present expenditure of £23,000 per annum in the meantime so that the immediate sum we would be prepared to allocate on the £ for £ basis would be £27,000, but the effect of the work done by the Central Fertiliser Office would no doubt tend to enable us to cut down a part of our own expenditure in time, and we would be willing to contribute any saving thus effected by us on the £ for £ basis. Thus if our own expenditure were

* The staff of Nitram includes an Intelligence Department which deals exclusively with the collection and dissemination to our other departments at home and abroad of all information relating to fertilisers. Experience has shown that such a department, staffed by officers with high scientific qualifications, is of the greatest value in providing sound material on which to base propaganda. Needless to say, the Intelligence Department of Nitram will lend all possible assistance to the proposed Central Fertiliser Office in India.

reduced to £20,000 per annum, we would be willing to contribute up to £30,000 on the £ for £ basis and so on. The sum which we would allocate on the £ for £ basis would not in any event be less than £27,000.

10. Suggestions have been made from time to time by various bodies, including the Indian Sugar Committee in their report of 1921, that efforts should be made to increase the supply of home-produced nitrogen in India.

Since that report was published, nitrogen prices in the world have fallen by about 50 per cent. and we are satisfied that the requirements of the ryot in artificial forms of nitrogen can, for the present, be met most cheaply by imports of suitable forms.

At the moment, the fertiliser trade is being revolutionised by the manufacture at the air nitrogen works of very high-testing forms of nitrogen and by the synthesis of compound fertilisers such as di-ammonium-phosphate and di-ammonium-phosphate-potash, which contain up to 70 per cent. of plant food instead of the 15 per cent. to 20 per cent. compounds hitherto available.

The possibility of making nitrogen from the air in India has been the subject of an exhaustive examination by Synthetic Ammonia & Nitrates Ltd., and the conclusion reached is that under present conditions it is not economic.

At the present low price for nitrogen, and in view of the prospect of still lower prices in the future, only very large-scale units with a minimum capacity of about 150,000 tons of pure nitrogen per annum can be expected to pay, even under the most favourable conditions in Great Britain and Europe. Conditions in India are far less favourable from an economic point of view.

Nevertheless, if the demand for artificial fertilisers in India should develop to an extent which made it unsafe to rely on importable supplies, Imperial Chemical Industries are prepared to consider the erection of air nitrogen works in India.

NITRAM, LIMITED.

AGRICULTURAL RESEARCH AND ADVISORY DEPARTMENT.

Director: Sir Frederick Keeble, F.R.S.
Assistant Director: Mr. T. H. J. Carroll.

RESEARCH DEPARTMENT.

Chief Chemist and Head of Research Laboratory: Mr. H. J. Page, with staff of Chemists and Analysts investigating soil, plant and fertiliser problems.
Animal Nutrition Chemist: Mr. S. J. Watson.
Agricultural Botanist: Mr. G. E. Blackman.

EXPERIMENTAL FARM.

Chief Farm Officer and Economist: Colonel W. R. Peel.
Assistant Farm Manager: Mr. S. E. Buckley.

INTELLIGENCE DEPARTMENT.

Chief Intelligence Officer: Dr. E. H. Tripp, and a trained staff.

PUBLICITY DEPARTMENT.

Publicity Officer: Mr. D. L. Blumenfeld.
Editor of Publications: Mr. A. B. Bruce.
Show Superintendent: Mr. W. Weir.

GRASSLAND ADVISORY DEPARTMENT.

Chief Grassland Adviser: Mr. R. Lindsay Robb.

ADVISORY DEPARTMENT.

Fifteen qualified Agricultural Advisers in Great Britain and Ireland.

Mr. F. C. O. Speyer.

Memorandum on the Need for Artificial Fertilisers in India and Various Problems connected with Supply, Distribution and Credit.

1. *Statistics omitted.*—In order to make this memorandum as succinct as possible, it is assumed that the Members of the Commission will have been provided with full statistical information in regard to the growth of population, acreage of crops, methods of cultivation and credit facilities available on the one hand, and the results of the scientific experiments on manuring carried out by the various agricultural stations at Pusa, Poona, Tocklai, &c., on the other.

2. *Function of artificial fertilisers.*—The proper use of artificial ferti lisers is so little understood at the present time, even in the greater part of Western Europe, and knowledge of the true relationship between conditions of soil and climate, the application of fertilisers and plant growth is so scanty (in spite of the vast amount of experimental work already done) that it may perhaps not be out of place to formulate one or two elementary but fundamental propositions.

3. The chief function of artificial fertilisers is to restore to the soil the essential plant foods which are removed from it in the crops. The popular view, still unfortunately held by many farmers in England, is that artificial fertilisers merely act as a stimulant and that consequently their continued use ultimately "ruins" the soil; the analogy appears to be drawn from human abuse of alcoholic stimulants.

Nothing could be further from the truth. While certain forms of nitrogen have a remarkably rapid effect in promoting leaf development and the plant therefore appears to have received a stimulant, the development is, in fact, due to the supply of the right plant food at the right time and in a form which is available to the plant.

The three principal foods required by the plant are nitrogen, phosphoric acid and potash, and the soil must always contain a sufficiency of lime or other basic material. In order that the plant may attain its full development, it is necessary that all these plant foods should be present in the soil in the correct proportion and in available form.

4. *Scientific experiments needed.*—Analysis of the soil can show what elements of plant food are lacking and what elements are present, but no method of soil analysis has yet been evolved which will indicate what proportion of the plant foods are present in available form.

The only safe method of arriving at the plant's requirements is to conduct scientific experiments spread over a period of years. The results of such experiments will show in what proportion it is necessary to supplement the available supply of nitrogen, phosphoric acid and potash in the soil, and the best form in which to provide these plant foods, taking into account the conditions of soil and climate in each experiment. The experiments should whenever possible, be conducted on a "field" scale and under actual farming conditions as far as possible. Small plot experiments are useful for certain purposes, but the results obtained and especially the calculations made from them are likely to lead to erroneous conclusions if applied without considerable qualifications to "field" conditions.

Now, the carrying out of scientific experiments is always a costly matter and it will be specially costly in countries like India, in which you have an uninstructed farming class, liable to make elementary errors at every stage of the experiment and therefore requiring minute supervision by qualified persons.

To attempt to carry out, all over the vast continent of India with its varying climates and multifarious conditions of soil and cultivation, experiments on anything like the scale and the standard of scientific accuracy

practised at Rothamsted for over eighty years, would mean an increase in the personnel and expenses of the Agricultural Departments which it would be Utopian to hope for under present conditions.

5. *Experience of other countries.*—Fortunately, however, it is possible (*a*) to profit by the experiments made in other countries in determining the needs of a particular district, and (*b*) to arrange a series of experiments or demonstrations on a field scale in that district which demonstrations, while making no pretence to scientific accuracy, nevertheless will indicate those elements of plant food which are lacking.

(*a*) A consideration of the results of experiments carried out in both tropical and temperate zones is leading modern agricultural chemists to the conclusion that nitrogen is by far the most important factor in promoting increase in yield of crops. If the best possible result is to be obtained, all the three essential plant foods mentioned above must be available in the proper proportion to the plant, and it is, of course, assumed here that good seed and proper methods of cultivation are employed. But it is in regard to what constitutes an economic optimum in the relationship of the three plant foods that modern agricultural theory and practice differ most markedly from the theory and practice still current only a decade or so ago. Thus, for example, up to 1913 the usual proportion in use in Germany was about 1 part nitrogen (N): 3 parts phosphoric acid (P_2O_5): and 2½ parts potash (K_2O). The actual quantities used successfully during the last two or three years in Germany give a relation of 1 N: 1.1 P_2O_5: 2.1 K_2O.

This change has led to the formulation of the proposition that only sufficient quantities of P_2O_5 and K_2O (in available form) should be present in the soil or added to it, to enable a maximum result to be obtained from nitrogen.

The economic problem of manuring is thus essentially a nitrogen problem.

(*b*) *Demonstrations.*—While the accurate scientific experiment will alone show the maximum quantity of nitrogen which will yield an economic result under any given set of conditions, the demonstrations above mentioned will serve as a useful practical guide as to what quantity of nitrogen can be relied upon to yield a profit on an average in the majority of cases.

6. *Endow the Agricultural Departments of India.*—The Agricultural Departments throughout India should therefore be provided immediately with adequate financial resources to enable them to increase their staffs to a point which will allow them to undertake as many accurate scientific experiments as possible with a view to determining the manurial requirements of the districts under their charge

It is desirable that all the departments should adopt a uniform plan in regard to trials on each crop, so that comparable results may be obtained from as many different centres as possible.

The field demonstrations can be left to respectable commercial undertakings between whom and the Agricultural Departments there should exist a close co-operation. If the Agricultural Departments can undertake to supervise the demonstrational activities of the commercial firms, so much the better.

7. *Economic importance of fertilisers.*—It is almost impossible to overstate the economic importance of the problem of increasing the yield of crops in India. The population has increased by over 100 millions during the last half century, and better economic conditions, greater freedom from famine and the inculcation of more hygienic ways of living will probably promote a still larger increase in population during the present half century.

Mr. F. C. O. Speyer.

Nevertheless, a very large proportion of the population may still be said to be in a chronic state of under-nourishment, and this is no doubt the real cause of the appalling mortality occasioned from time to time by the ravages of epidemics like the influenza attack in 1918, when about 7 millions died.

No permanent relief can be expected from an increase in extensive cultivation, and many large agricultural areas in India are already more densely populated than Belgium.

The only permanent remedy is to increase the yield of the existing crop areas and the essential requirements in this respect are better seed, better methods of cultivation, and liberal use of artificial fertilisers, especially nitrogen, which must of course be available at an economic price.

The economic result of an increase in crop yield is two-fold: it enables a given area to support a larger population, and it sets free a larger proportion of the total population for activities other than agricultural.

The more intensive the methods of cultivation, the greater will be the proportion of the population set free for industrial and commercial pursuits.

8. *Use of artificials in India.*—Up to about two years ago the use of artificial fertilisers, and especially of nitrogen, in India was infinitesimal and was largely confined to tea, and to a lesser extent to rubber plantations. Ceylon was responsible for a large proportion of the total consumption.

(a) *Nitrogen on plantations.*—This was a natural development, for the advantages of using artificials on plantations are striking.

Recent experiments show that a judicious use of artificials will shorten the period of preliminary growth in a plantation by up to 50 per cent., and will greatly lengthen the life of all permanent tropical crops which require a considerable amount of nourishment. To give examples: the period of preliminary growth for bananas in Central America is normally 20 to 24 months: the use of artificials, in which nitrogen has predominated, has reduced this period to 12 to 14 months. The normal life of a coffee-tree is usually assumed to be about 60 years; properly-manured coffee-trees, however, are known to give satisfactory yields when over 100 years old. In Central America unmanured coffee is not ready for picking until the fifth year, but manured trees come into bearing in the third year.

An important subsidiary function of nitrogen in promoting heavy leaf development is to afford the soil shade at an early period. This stops the growth of weeds and eliminates the cost of one or more weedings.

The reluctance of tea-planters to use nitrogen, because of the alleged bad effect on quality, is gradually disappearing with the realisation that the effect of the nitrogen is to promote earlier and more rapid leaf development, and that therefore earlier and more frequent pickings must be arranged if it is desired to obtain leaves in the same stage of growth as on unmanured plantations.

Experiments now being carried out on rubber at Mundakayam, Travancore, by Mr. Herbert Ashplant, the Rubber Specialist, indicate provisionally that certain forms of nitrogen may play a very important part in helping to prevent defoliation through secondary leaf fall disease. Details will be found in Mr. Ashplant's Annual Report.

(b) *Nitrogen for native-grown crops.*—Although a considerable amount of experimental work had been done by many of the Agricultural Departments, and efforts had been made by the propaganda organisations of the producers of certain forms of nitrogen, such as cyanamide and nitrate of soda, to introduce these fertilisers on a practical scale, no considerable attempt to promote the use of nitrogen and other artificials on crops cultivated by natives was made until the effort of the British Sulphate of Ammonia Federation, Ltd., in 1923.

Up to that date, more than two-thirds of the production of ammonium sulphate by the coke-ovens north of Calcutta had been regularly exported to Java, in order to assist the Javanese sugarcane growers to obtain the large increase in yield which enabled them to sell sugar to India. The economic effect of this exchange was to deprive India of an essential raw material for the growing of sugar and thus unnecessarily to increase the toll which India pays to Java.

Sugar position.—The position in regard to sugar is sufficiently surprising to deserve detailed notice. Before the War India was the third largest importer of sugar in the world and has regained that position since 1921. India imports annually about 500,000 tons of sugar of the value of £18 million. Java has 400,000 acres under sugar, uses about 15,000 tons of pure nitrogen for it and produces 1½ million tons of sugar per annum. India has 2¾ million acres under sugar and produces 3 million tons of "gur" equal to about 1¼ million tons of Java sugar. The yield per acre in tons, 90 per cent. of which is obtained as refined sugar, is 4;12 in Java, 4;6 in Hawaii and 1;96 in Cuba. In India the total yield is only 1;07 tons per acre and of this only 0;57 tons per acre is obtained as refined sugar.

Federation's organisation.—The Federation through their agents, Messrs. Shaw, Wallace & Co., of Calcutta, Bombay, etc., and with the co-operation of the late Mr. A. B. Modak of Poona, who had made an intensive study of the problem of the use of artificials for many years under the guidance of the Department at Poona, determined to endeavour to put an end to this economic anomaly.

Arrangements were made with the producers in India by which they entrusted the sale of their product to the Federation, and the Federation immediately arranged for an intensive propaganda campaign among the sugar and cotton growers in the Bombay deccan, under Mr. Modak's supervision and with the assistance of a Indian staff of about 40 persons.

Indian output of ammonium sulphate consumed locally.—The results of this campaign have been surprisingly rapid and successful, and have already stimulated similar activity in other provinces.

Not only is the whole local production of ammonium sulphate in India being readily absorbed in the country at the present time, but increasingly large quantities of nitrogen are being imported. The local production amounts to about 3,000 tons of pure nitrogen per annum, and the imports for the coming season are likely to amount to at least an equal quantity.

9. *Future prospects.*— The experience gained in this brief period of under three years is of course far too meagre to permit of any definite conclusions being drawn from it at present.

Moreover, it does not necessarily follow, because the use of nitrogen in conjunction with other artificials has been found to yield an economic profit in the Bombay Deccan, that it will prove economical to use it in other parts of India, even if its use is beneficial to the crop selected.

Owing to the enormous variations in soil and climate and economic conditions, generalisations about "India" are likely to prove almost worthless.

Nevertheless, the prospect held out by the information already obtained is sufficiently encouraging to warrant steps being taken to increase the scope of the Federation's propaganda and selling organisations.

Enlargement of Federation's Organisation.—This has necessitated an alteration in the conception of the scheme. The original problem was whether and how the limited output of ammonium sulphate in India could be consumed locally.

Mr. F. C. O. Speyer.

The problem now is to provide an organisation which will be in a position to supply India not only with ammonium sulphate and other forms of nitrogen, but also with the quantities of phosphoric acid and potash required, in suitable form.

The Federation has therefore formed an Associated Company called Nitram, Ltd., in which Brunner, Mond & Co., Ltd., are largely interested as makers of nitrogen products from the air. Between them, the Federation and Nitram, Ltd., are in a position to provide nitrogen in both ammoniacal and nitric form. While ammonium sulphate has proved a valuable form of nitrogen in many parts of India, it seems likely that other forms will be required to satisfy all the varying needs of the country.

An arrangement has also been made whereby Messrs. Shaw Wallace & Co. will, in the meantime, supply the well known forms of phosphates and potash. At a later stage, it may be found advantageous for Nitram, Ltd., to supply a complete fertiliser to be made at the Air Nitrogen Works.

Retail Selling Organisations.—At the same time the Federation's distributing machine in India is being expanded by the creation of two retail selling organisations, Indo-Agri., Ltd., and Brunner Mond & Co. (India), Ltd.

One hundred up-country village selling depots are already in being at which ryots can purchase any quantity of fertiliser from a small bag upwards, and it is proposed to increase the number of depots as occasion requires. It is contemplated that in a few years' time from 5,000 to 10,000 of such depots will be required and available.

The effect of all these arrangements will be to enable the two retail selling organisations to inform the Agricultural Departments that they are in a position to stock and sell any fertiliser which the department considers desirable. No attempt will be made to foist fertilisers on the ryots which scientific experience condemns in the particular circumstances. It is fully realised that permanent success can only be achieved by supplying the needs of each district, as determined by scientific research.

Propaganda.—A separate company called " Fertiliser Propaganda Company of India, Ltd.," is being set up to deal with propaganda. This company will gradually build up local propaganda organisations, on the lines of Mr Modak's organisation at Poona, throughout those districts which appear to offer a prospect of profitable results from the use of fertilisers.

The Fertiliser Propaganda Co. of India, Ltd., will keep in close touch both with the retail selling organisations and with the Agricultural Departments.

In cases in which the Agricultural Department desires the active co-operation of the Propaganda Company, this will be readily afforded, but no attempt will be made to obtrude the work of the Propaganda Company on any Agricultural Department which prefers to conduct its scientific work entirely independently in its own area.

The services of Mr. C. M. Hutchinson, late of Pusa, have been secured for a limited period with a view to strengthening the scientific direction of the Propaganda Company.

10. *Price Factor.*—No useful purpose is achieved by advocating the use of artificial fertilisers unless it can be shown that they give an economic return.

The relation between the cost of the fertiliser and the monetary value of the increase in crop yield is therefore vital.

In European countries at the present time, while phosphoric acid and potash are about on a pre-War level of price, the selling price of nitrogen is considerably below the pre-War level. A complete fertiliser is therefore obtainable either at or slightly under pre-War level. At the same time the

index figure for almost all agricultural produce is far in excess of the pre-War index.

The following table has been compiled to show the economic results of the use of nitrogen in Germany in the year 1925-26, and is based on the results of a large number of experiments.

Profit to be derived from 1 kg. of nitrogen costing Mk., 1,10.

	Wheat.	Potatoes.	Sugar Beet.
Average increase in weight ...	20 kg. grain 30 kg. straw	100 kg. ... —	150 kg. beet 100 kg. tops
Financial result	Mk. 4,90 ...	Mk. 3,10 to Mk. 6.	Mk. 5,70
Percentage return on capital outlay in nitrogen	345 % ...	182 – 445%	418%

Under such conditions, there is clearly an enormous economic advantage in using nitrogen. Some British results and comparisons will be found at the end of this memorandum.*

Cost of transport and distribution in India.—The high cost of transport and handling in India greatly affects similar calculations for Indian conditions. While India is able to obtain supplies of nitrogen and other fertilisers delivered to her ports at little over the prices ruling in European countries, the freight and insurance only amounting to about 24s. per ton, the price which the ryot has to be asked to give, even for cash payment, is regrettably high.

The inability of the Indian railways to deal promptly with cargo on arrival at the port involves storage of the goods at the port with consequent heavy handling charges. The actual railway rates are very high—it costs more than double the freight from England to any Indian port to transport ammonium sulphate from the works near Calcutta to the Bombay Deccan. A further set of heavy charges is incurred in delivery from the inland railway station to the village depot, and to these have to be added the not inconsiderable cost of collecting and remitting the price.

In many cases the final price to the ryot is about 75 per cent. higher than the cost price of the goods in England.

Better railway facilities and cheaper rates wanted.—It is therefore earnestly to be hoped that the Royal Commission will draw attention to the need for better carriage facilities and a large increase in the number of trucks on the railways, and will recommend that preferential and favourable rates be granted on the transport of fertilisers.

11. *Credit.*—It is difficult to see how an adequate consumption of nitrogen and other fertilisers can be obtained in India unless the credit facilities at present open to the ryot are greatly extended and cheapened. The *sowcar's* rate of interest is considered moderate at 20 per cent., normal at 50 per cent., and he often obtains 75 per cent. The rates charged by the Co-operative Banks seem to vary between 8 per cent. and 18 per cent.

Now, quite apart from the social customs of the Hindus, which often involve virtual mortgage of their labour for indefinite periods, the normal procedure throughout the East, and probably among a majority of farmers in the West, is not to pay for their fertilisers and seeds until they have received payment for their crops.

If India's needs in respect of fertilisers are to be satisfied on this basis, colossal capital resources will be required.

* Appendix I.

Mr. F. C. O. Speyer.

The Federation is prepared to give credit in indirect form by holding fertilisers in stock at the depots mentioned above. If the number of depots is increased to 10,000 and a minimum stock of only 10 tons of ammonium sulphate, e.g., is kept in each depot, that involves locking up a capital value of about £1½ millions. It is not impossible that the total consumption of nitrogen in India during the next decade may reach the equivalent of 500,000 tons of ammonium sulphate, representing a capital value of about £7 millions. And nitrogen is only one element in the ryot's requirements.

It seems hardly likely that private producing interests will care to take the risk of giving credit to such an extent.

The problem seems capable of solution by a combination of (*a*) increased Government financial support for the co-operative movement, which has improved its position so remarkably within the last few years, and (*b*) direct or indirect grant of credit by the Government.

The Royal Commission will receive ample evidence in regard to (*a*) from the co-operative movement itself.

The following suggestions are offered in regard to (*b*). A large proportion of the one to eight acre holdings of the 167 million cultivators in India are the property of the Government, the revenue derived being equivalent to rent. The assessments are made every 30 years and rise with the increased value of the land. The Government as landlord therefore has a direct interest in the increase in productiveness of the land.

In Egypt, where a similar state of affairs exists, the Government now buys fertilisers in bulk and distributes them to the fellaheen on credit terms. Payment is collected together with the payment of the rent of the land, and the Government has the power of sequestration if the fellah fails to pay.

Method adopted by the Egyptian Government.—Copies of the forms used by the Egyptian Government are appended.*

The collectors are the Sarrafs, who work under the Moudir or Governor of each province and the Inspector of Finance. The Budget for the Sarraf Service amounted to £ E.186,752 for 1924. Their main work is the collection of land tax, which provided revenue to the extent of £ E.5,200,300 for 1924-25.

Each taxpayer is given a tax-paper which shows the sum due to the Government and the due date for each instalment. In the event of failure to pay the tax or the amount due for fertilisers a system of administrative seizure is allowed, which is regulated by the Decrees of March 25th, 1880, November 4th, 1885, August 8th, 1892, and March 26th, 1900.

Requisition form No. 1 signed by the Sheikh of the village, the Omdeh, the Sarraf and the Provincial Inspector of the Ministry of Agriculture, contains the names of the applicants and full details of the quantity of fertiliser required and the amount of land-tax fixed, together with a certificate of respectability.

Requisition form No. 2 is a delivery order for the fertiliser signed by the individual applicant, the Omdeh, and the Sarraf.

The amount of land-tax is settled by land valuations which hold good for 30 years.

An alternative suggestion.—If it is considered undesirable that the Government of India or the Provincial Governments should go as far as the Egyptian Government in engaging in the actual purchase and sale of fertilisers, perhaps the Government might be willing to grant facilities for the discounting by the Banks of trade bills drawn against delivery of approved fertilisers and to undertake to bear a definite percentage of any bad debts incurred.

*Appendices II and III.

If the traders had to take a substantial portion of any loss, the Government share of actual losses would almost certainly be more than compensated by the increased revenue derived during the next period of 30 years.

Government intervention should have the effect of bringing down the extravagant rates obtained by the *sowcars*.

The initial difficulty in many cases will be to get the ryot out of the clutches of the *sowcar*.

It is understood that the Siamese Government has adopted successful measures in this respect with the help of the local co-operative societies. At the time of writing, the papers giving details of these measures are unfortunately not to hand.

12. *Adulteration.*—As the use of artificial fertilisers expands and more and more middlemen enter the trade, as they have done in all other countries, the opportunities for the abuse of the ryot's confidence in the matter of adulteration will increase. The difficulties of adequate inspection are sufficiently formidable even in the United Kingdom, and it seems doubtful whether the regulations embodied in the Fertiliser and Feeding Stuffs Amendment Bill recently introduced in the House of Lords could be applied in India, or whether, if applied, they would successfully cope with the evil they are designed to combat.

Probably the only successful method of dealing with this problem in cases where the agricultural population is largely illiterate is to foster a spirit of reliance on the Agricultural Departments.

This system has to a very large extent prevented fraud and adulteration in Japan, where the farmers are accustomed to send samples for analysis to the agricultural experimental stations of the Government, whose advice on this and other matters is readily sought and appreciated.

The Agricultural Departments in India should be put in a position to make such analyses and to give such advice to the ryot.

13. *Irrigation.*—No attempt has been made in this memorandum to deal with the question of water supply, as it is felt that the Royal Commission will have ample evidence from better-informed sources at their disposal.

It should be stated, however, that an adequate supply of water, either by precipitation or by irrigation, is an essential pre-condition to the successful use of artificial fertilisers, and in many cases limitation of water supply means a reduction in the amount of fertiliser which would otherwise prove profitable.

This generalisation may be regarded as of universal application in spite of the fact that recent experiments on cotton by Mr. Modak and others indicate that ammonium sulphate possesses the quality of helping to conserve the soil moisture available for the plant and thus assists it to tide over temporary periods of drought.

14. *Plant breeding.*—For the reason given above, the problems of seed selection and plant breeding have not been dealt with, although they too are of supreme importance in creating the possibility of deriving the maximum advantage from the fertilisers used.

Recent researches of Professor Baur of Berlin and Professor Nilsson-Ehle of Lund University, Svalof, have established to their satisfaction that it is possible to create new types of plants which will respond to far greater doses of nitrogen than it is safe or economical to apply to existing types.

Lengthy, laborious and costly research work is required for this purpose.

The Federation will be happy to place at the disposal of the Royal Commission the evidence of Mr. D. B. Modak of Bombay, who is carrying on his brother's work, and can supply details of the results of his experiments if required

Mr. F. C. O. Speyer.

APPENDIX I.

Some Results obtained in Great Britain and Ireland.

Economic advantage of using 1 cwt. Sulphate of Ammonia. Under certain circumstances the addition of a second cwt. of Sulphate of Ammonia gives a greater proportionate increase.

Crop.	Year.	Average Price.	Cost of 1 cwt. S/Ammonia.	Value of increased crop.	Net profit from the use of 1 cwt. S/A.	Percentage return on outlay.
			s. d.	£ *s. d.*	£ *s. d.*	
Wheat	1914	4/4½ per bushel of 63 lbs.	13/3 (95% pure)	4½ bushels @ 4/4½ = 0 19 8	0 6 5	48·4
	1925	6/10 „ „ „ 63 „...	13/11 (20·7%N.)	4½ „ @ 6/10 = 1 10 9	0 16 10	120·99
Oats	1914	2/7½ „ „ „ 42 „...	13/3	7 „ @ 2/7½ = 0 18 4½	0 5 1½	38·68
	1925	3/8 „ „ „ 42 „...	13/11	7 „ @ 3/8 = 1 5 8	0 11 9	84·4
Barley	1914	3/4½ „ „ „ 56 „...	13/3	6 „ @ 3/4½ = 1 0 4½	0 7 1½	53·77
	1925	5/10½ „ „ „ 56 „...	13/11	6 „ @ 5/10½ = 1 15 3	1 1 4	153·3
Potatoes ...	1914	66/- per ton	13/3	1 ton ... ... = 3 3 0	2 19 9	450·94
	1925	£8 0s. 6d. per ton ...	13/11	1 „ ... ... = 8 0 6	7 6 7	1053·29
Meadow ...	1914	59/6 per ton	13/3	10 cwts. ... ... = 1 9 9	0 16 6	124·5
Hay	1925	£4 0s. 6d. per ton ...	13/11	10 „ ... ... = 2 0 3	1 6 4	183·2
Clover	1914	71/6 per ton	13/3	10 „ ... ... = 1 15 9	1 2 6	169·8
Hay	1925	£4 12s. 0d. per ton. ...	13/11	10 „ ... ... = 2 6 0	1 12 1	330·5
Swedes	1914	20/6 per ton	13/3	1 ton ... ... = 1 0 6	0 7 3	54·7
	1925*	15/- per ton Ministry Fig.	13/11	1 „ ... ... = 0 15 0	0 1 1	8·0
		20/- per ton Rothamsted „		= 1 0 0	0 6 1	43·7
Mangolds ...	1914	17/6 per ton	13/3	1 „ ... ... = 0 17 6	0 4 3	32·1
	1925*	12/- per ton Miuistry Fig.	13/11	1 „ ... ... = 0 12 0	−0 1 11	−13·8
		18/- per ton Rothamsted „		= 0 18 0	+0 4 1	+29·34

* Based on February and December prices only.

APPENDIX II.

MINISTRY OF AGRICULTURE.

Commercial Section.

(Requisition Form No. 2. "Fertiliser".)

Serial No.....

Village .....

Markaz.....

Mudirieh .....

Delivery Order for Sulphate of Ammonia.

Bags.

.....

Applicant's Name .....

Folio in Journal.....

MINISTRY OF AGRICULTURE.

Commercial Section.

(Requisition Form No. 2. "Fertiliser".)

Mudirieh..... Markaz..... Village.....

Serial No.....

Delivery Order for Sulphate of Ammonia.

By this, authority is given to deliver to.....

Bags

inhabitant of this village quantity.....

(.....Bags) Sulphate of Ammonia from.....

£ M/ms

station at..... (.....pounds .....m/ms), who undertakes to settle their cost in one payment together with the tax instalment for May and June 192... and in faith of which he has signed this with us and must sign once again at the time of delivery.

.....192...

(Signature of the Sarraf of the village)

(Signature of the Omdeh)

(Signature of the Applicant)

A/c. folio in Journal

.....

Document of Receipt.

I have received the Sulphate of Ammonia and undertake to settle the cost in the way mentioned above.

(Signature of the Applicant).....

Mr. F. C. O. Speyer.

APPENDIX III.

MINISTRY OF AGRICULTURE.

(Requisition Form No. 1 " Fertiliser ".)

Commercial Section.

Statement of fertilisers ordered on credit for cultivators of the village .....Markaz.....Mudirieh.....

Each of the undersigned bought from the Ministry of Agriculture the quantity of fertiliser shown against his name and undertakes to pay the cost shown on the left, in one instalment, in the hands of the Sarraf who has the right to collect same in the usual way together with the tax instalment for the month of.....192..... The Inspectorate of the Ministry of Agriculture has the exclusive right of decreasing or cancelling the quantity which any one of us bought without any responsibility whatever on the part of the Government occasioned by such a decrease or cancellation. And in case any one of us does not take delivery of the whole or part of the fertiliser, which would have been authorised, after thirty days from the fixed date of acceptance of the orders, for the.....manuring season, he will be obliged to pay twenty piastres per bag not taken delivery of, by way of settlement as a compensation for damages and for transport expenses, &c., which the Ministry would have incurred, and the Ministry will have the right to sell it to any other cultivator. In case also it will be proved that any of us will be trading in the quantity which has been delivered to him or not using same for the manuring of his own crops, he will be obliged to pay to the Ministry by way of settlement, besides the price shown, a sum equal to half of the cost of the fertiliser by way of a fine.

No. of Requisition Form No. 2.	Quantity of fertiliser applied for.	Kind of fertiliser.	Price.	Superficiency of lease (Teklif).	Amount of Tax fixed.	Fol. in Journal.	Fol. in Ledger.	Name of Applicant.	Place of residence.	Seal or signature of Applicant.
	Bags		£M/ms	F.K.S.	£M/ms					
				Total.						

Kinds of fertiliser	
Bags.	
.....	Sulphate of Ammonia.
.....	Nitrate of Soda.
.....	Superphosphate of Lime.
.....	Nitrate of Lime.
	Total.

Only.....bags, at.....pourds.....m/ms.

This statement has been made out in detail. The store of delivery is....., and we declare that the applicants mentioned are not as a rule late in the payment of what is due to the Government, and have not had any previous dispute with the Government, the property deed of their land is not being withdrawn, nor is their land seized and there is nothing which may create doubt that the land is their property.

Signature of the Sheikh.	Signature of the Omdeh.	Signature of the Sarraf.

.....192...

Reviewed, Approved.....192...

Signature of Censor. The Inspector of Agriculture of Mudirieh.....

Oral Evidence.

56,320. *The Chairman*: Mr. F. C. O. Speyer, you are General Manager of Nitram, Ltd., and of the British Sulphate of Ammonia Federation, Ltd.?—Yes

56,321. You have given us a Note of the evidence which you wish to put before the Commission. Would you like to make any addition to that by any statement?—No.

56,322. As you mention in paragraph 1 of your note of evidence, we have had the advantage of hearing the views of Mr. Hutchinson and Mr. Maurer. I think you have seen their evidence. Do you agree with it?—Yes.

56,323. On page 474 of your Note, you mention Messrs. Indo-Agri, Ltd., as being another retail selling organisation. That organisation, you say, was formed by Messrs. Shaw, Wallace & Co. Is that organisation in competition with your own?—Yes, and no. We are trying out the two different systems of retail selling in India at the present time. Messrs. Indo-Agri, Ltd., was the idea of Messrs. Shaw, Wallace & Co., and they are working on the basis of a fixed profit, as Mr. Maurer mentioned in his evidence. They are also working on a system of fixed allowances to the holders of selling depots. With our experience of selling in other countries, especially in China, we have come to the conclusion that a system which avoids these fixed charges and which bases the remuneration of the selling agent and the depot holder on a commission basis proportionate to what he sells, is going to be a better system of selling than the system inaugurated by the Indo-Agri Company; but we have had

some experience of the second system of selling, that is to say, the system of selling on commission in India, because Messrs. Brunner Mond & Co., India, Limited, have succeeded in selling a very large quantity of soda ash and other ammonia-soda products on that system in India. We do not, however, feel that the two systems have been tried out side by side long enough at present to enable us to make a complete decision on the point.

56,324. Does the question of holding large stocks in advance depots touch this issue at all?—I do not think so. We are prepared to hold stocks either in this country or at the ports in India or at the up-country depots. It does not make very much difference to us where we hold the stocks.

56,325. To what extent are you not in competition with Messrs. Indo-Agri?—To this extent: that Indo-Agri and Brunner Mond, India, Limited, the two retail selling organisations, have to sell at the same prices.

56,326. By agreement?—Yes.

56,327. From what you have stated, I gather that in your view the whole problem of the selling machinery designed to meet Indian conditions is still in the stage of experiment?—To some extent, yes.

56,328. You mention on page 474 that Nitram makes no profit on the sale of sulphate of ammonia; that is to say, Nitram themselves, after deducting the cost to Nitram of the product plus selling and transport charges in India?—Yes, that is the exact position. Nitram is simply a selling department of the British Sulphate of Ammonia Federation and Synthetic Ammonia and Nitrates, Ltd.

56,329. You formed a Company to finance and carry out that work?—Yes.

56,330. Does this point as to Nitram making no profit apply to Nitram's operations everywhere or only in India?—It applies to Nitram's operations everywhere in sulphate of ammonia.

56,331. In India, does it apply to Nitram's operations in all fertilisers or only to sulphate of ammonia?—There again it would apply only to sulphate of ammonia.

56,332. In India only?—Yes. Its application to other fertilisers would depend to some extent on the domestic arrangements between ourselves and Synthetic Ammonia and Nitrates, Ltd.

56,333. So that as regards other products handled by Nitram, a profit may be made by Nitram?—Yes.

56,334. In paragraph 7 on page 474 you suggest that a Central Fertiliser Office under Government should be constituted and that representatives of the Central Government, of the Agricultural Department, of the provincial agricultural departments and also of Nitram, Ltd., should sit upon the controlling body?—Yes.

56,335. Are there, within your knowledge, any organisations in countries other than India exactly parallel to that arrangement?—I do not think exactly parallel. There is something very much like it in the Soudan at the present time. The relation between the Soudan Government and the Soudan Plantation Syndicate is very similar in a number of respects to what we are suggesting here, although, of course, that is more of a commercial arrangement than what we are venturing to suggest here.

56,336. Do you know of any cases in America which are in any way parallel?—There is a certain amount of collaboration now between the various State agricultural stations and the fertiliser trade. That has not so far produced very marked results, so far as we can make out.

56,337. You mean in terms of increased sales?—I should say rather in terms of improving the extraordinarily low grade fertilisers which are sold in the United States.

56,338. But those instances are analogous to this extent, that they are typical of an arrangement between the Government on the one hand, and concerns trading for profit on the other hand?—Yes.

56,339. Is it your view that a simple fertiliser office should include, within the scope of its enquiry, the use and distribution of natural manures?—I think that would be a very important part of its function. It is quite obvious that artificial fertilisers cannot be permanently satisfactory as substitutes for natural fertilisers. You must replace the humus in the soil and you can only do that by using natural fertilisers. Therefore that would certainly be necessary.

56,340. The use of natural fertilisers is complementary rather than competitive with the use of artificial fertilisers. Is that what you say?—Yes. Our idea is to use artificial fertilisers to eke out the deficient supply of natural fertilisers in India.

56,341. An experiment designed to work out the agricultural and technical problems involved would have to take cognisance of those problems attached to the use of natural manures in conjunction with the artificial article?—Certainly.

56,342. If it was thought well to include amongst those who will form the membership of the body controlling the Fertiliser Office, and therefore the body responsible for recommending that particular pieces of research work should be taken up, a representative, for instance, of the cultivating class or representatives of parties interested in the ownership of land in India, would you have any objection to that?—None at all. We should welcome it.

56,343. Is it your idea that research work recommended by this body should be carried out wherever conditions and facilities seemed to make it desirable that they should be carried out?—I think so. I think the natural centre point for the experiment would be the provincial Agricultural Department to start with; then the Central Office would have to rely on the experience of the Central Department to suggest other places where experiments might be profitably carried out.

56,344. You are, I think, already spending £23,000 per annum?—Yes, that is so.

56,345. Is any of that £23,000 being spent on research work carried out by Government officers?—No, it is not. We have been in a difficulty with regard to that. When we started work in India the agricultural departments maintained a rather reserved attitude, and quite rightly, I think, because there was evidence that they had been very badly let down in the past by people selling fertilisers. Therefore we hesitated to approach them by way of offering them assistance, in kind or money. We thought it was better, really, that the Agricultural Department should indicate to us on what lines we could usefully carry out experiments, and that we should carry out those experiments ourselves. The attitude of the departments is now, however, changing very considerably, and we have had offers from the departments to carry out experiments with our assistance.

56,346. Under your present suggestion in this paragraph, would the £23,000 be available for research work (of course under the conditions which you stipulate) to be carried on by the Agricultural Department just as the new money, the £27,000, would be available?—Yes, within the limits of the total sum which we have suggested. We are spending that £23,000 at the present time very largely on the Indian organisation, as you will see by the percentage of expenditure which I have given. The £23,000 is therefore being absorbed in our present activities.

56,347. That is what I want to get at. How much would be available for new research?—We are prepared to go on. I prefer to say that none of the £23,000 would be available for new research, but that we would

be willing to put in the next £27,000 for research and experiment, provided similar sums were forthcoming from other sources.

56,348. *Professor Gangulee*: In that case you would give this £50,000 entirely into the hands of a central organisation?—No. In that case we should allocate £27,000 for expenditure in connection with the Central Office while continuing to spend £23,000 ourselves. It may be more. I am not limiting it to that.

56,349. *The Chairman*: It is just as well to have it plain; that would mean that if the Government gave £ for £ on what you are willing to spend at the discretion of the central organisation, the Government would be giving £27,000, and not £50,000. Is that so?—Yes.

56,350. You would be prepared to proceed on that basis?—Yes.

56,351. On page 476 you touch on the question of the feasibility of making nitrogen from the air in India. You say that after exhaustive examination the conclusion has been reached that under present conditions it is not economic; and then in the next paragraph you point out the limited demand in India for that class of product. Are there any other factors which make the manufacture of nitrogen from the air in India an uneconomic proposition?—Do you mean technical factors?

56,352. Yes?—That is really a difficult question on which I am not very well qualified to give evidence. I understand that the temperature of the water has a great deal to do with the possibility of making air nitrogen.

56,353. Is cheap power another factor?—Cheap power is certainly a factor.

56,354. Are you taking into consideration the prospective supply of cheaper power which is likely to result from the development of hydro-electric schemes?—When we went into it we had to look at the matter simply as a commercial proposition. If surplus power is going to be available that might alter the situation. You have rather an analogous position in Italy at the present time. A great deal of air nitrogen plant has been put up on the basis of water power, and it is now becoming clear that it will be more profitable to sell a portion of the electricity produced by that power for industrial purposes than by turning it into synthetic nitrogen.

56,355. Are you receiving as much help from the agricultural departments as you think you are entitled to?—The attitude of the agricultural departments has certainly changed very considerably of recent years. We have certainly met with no refusal on the part of any department in India to assist us, and a number of the departments are showing enthusiasm and every desire to be helpful at the present time.

56,356. Is it your view that much further research requires to be done in the field of the economic use of fertilisers on Indian crops, in order to ascertain whether it is going to pay or not?—Yes. I think we want a great deal more evidence about that, in addition to the evidence acquired on the purely agricultural side.

56,357. You have a world-wide business. Do you think that the information acquired by you in the course of that business is, to some extent, likely to make a contribution towards these technical and economic problems which we have been discussing in India?—To some extent. One has to be very careful in applying the agricultural or scientific experience gained in one country to a totally different set of conditions in another country; but world experience does help one to realise that there are certain general propositions connected with fertilising agriculture which are true of all tropical countries to a limited extent. On the economic side, of course, the experience of other countries is very valuable indeed. The experiment which we have been making in China during the last five years induced us to try the same system of selling in India. It was because we had been so successful in this up-country selling of small quantities at depots in China that we decided to try the same system in India. In that sort of way the experience is useful.

56,358. Where are you bagging in the case of these small up-country depots?—It is all bagged in this country. We are using a special bag of maund size equivalent to 80 lbs. gross. It is bagged at the works here and sent straight out to India sealed.

56,359. Is it cheaper to bag in small quantities in this country?—Yes, very much cheaper. The moment you begin handling the goods in India, the expenses pile up. Then, of course, there is always the risk of adulteration. It is very much safer to use a very good package here and to seal the bag and send it out.

56,360. What are your bags made of?—Jute.

56,361. Jute is bought in India, brought back to this country and made into bags, and you find, in spite of the expensive labour here that it pays you better to fill a *maund* bag made of jute and to pay the carriage all the way back to India?—Yes, it is more economical to do so.

56,362. *Professor Gangulee*: Are there, in India, adequate experimental data on which you can base your definite recommendation of artificial fertilisers for a particular crop in a particular area?—I would hardly like to say so. There is a certain amount of experimental evidence as a result of the work of the departments, but I should say it was quite insufficient at present.

56,363. Do you think a uniform plan in regard to manurial trials is absolutely necessary?—Yes, I think that is absolutely necessary.

56,364. Otherwise you cannot correlate the results?—Quite so.

56,365. You say you want to have a Central Office in India. A proposal has been made by Mr. Hutchinson for the formation of a Central Bureau of Information. Have you heard of that proposal?—Yes, I am aware of that proposal. We received a copy of it just after we had prepared the scheme which we ourselves have put up to the Commission. I would like to say that our own original idea was very much like Mr. Hutchinson's idea. Naturally, it was an attractive idea from our point of view to suggest that the Government should utilise our propaganda organisation out there as its Central Office with the possibility of a subsidy, but on reflection we came to the conclusion that there would be good reasons of public policy against such a suggestion. That is why we have put forward the essence of Mr. Hutchinson's proposal in the form in which it appears in this printed Note.

56,366. Therefore you differ to that extent from Mr. Hutchinson's proposal?—To that extent we differ from Mr. Hutchinson's proposal, and we would like you to take our proposal in substitution of Mr. Hutchinson's.

56,367. If you had a Central Office, would you be prepared to institute trials and investigations through that office? The direction for making experiments would be entrusted to the proposed Central Office?—We have rather conceived the Central Office as not being an executive office. We think the executive work would be better carried out by the provincial department. But we do not want to be dogmatic about that. We are simply putting this proposal forward as an illustration of what we think might be a workable scheme. If other suggestions are made which are also workable, we do not in the least rule them out.

56,368. On page 475 you say, "Besides the establishment of the Central Office we contemplate provision on the largest possible scale for experiments and demonstrations on the use of fertilisers. . . . and we also propose to institute trials of a somewhat more elaborate nature . . . ." Through what agency would you carry on that work?— That would depend to some extent on the funds which were available to the Central Office. We mean by that that we ourselves, in any case, intend to go on with these simple and complicated trials. If sufficient money is available to the Central Office to enable it to organise a very much larger series of trials and researches we shall be only too happy; we would naturally be quite prepared to make any scheme of ours conform to the general scheme prescribed by the Central Office.

56,369. What method do you follow in China, where you have been doing a good deal of propaganda?—Are you referring to selling?

56,370. No, for experimental purposes?—What we do there is this. First of all, we send out a qualified European who gets into touch with the educational bodies in China, such as the Universities. Then we endeavour to find Chinese who have graduated in those Universities, in agricultural problems or in fertiliser problems. Then we train other Chinese under those educated Chinese and send them into the villages.

56,371. I see that you make contributions to several Chinese Universities and to the Palestine Government, and so on?—Yes.

56,372. Do they carry on the work on your behalf?—Yes. The work in China is partly carried on by the Universities and it is partly carried on by our own people in the villages.

56,373. Have you your own farm in China?—We have a small experimental farm near Shanghai, but we prefer to rely mainly on ocular demonstrations carried out on the land of cultivators in or near the villages.

56,374. That is to say the demonstration side of the work is in your hands?—Yes.

56,375. And the experimental side of the work, in part, is in the hands of these subsidised institutions?—Partly, and partly in our own hands. We are making experiments ourselves at our own experimental farm.

56,376. On page 472 you say, "We have supported experiments at such institutions by grants in money and in kind, and we propose to continue to do so." Have you offered similar grants to any Indian experimental station?—We have not yet, for the reason which I explained to the Chairman a little earlier to-day, but we are prepared to offer grants in kind or in money if such were acceptable.

56,377. Has no such request for grants come to you from any of the provincial Departments of Agriculture?—Not as far as I am aware. The nearest approach to it has been a request from one of the Provincial Governments to us to supply staff to help them to supervise some experiments which they are making.

56,378. In answer to the Chairman, you described to us your two methods of retail sale. Have you formed any estimate as to the merits of the alternative methods of retail sale to which you have referred? How do they compare in cost one to the other?—Up to now the Indo-Agri system has been more expensive than the Brunner Mond system, but it is a little too early for us to make a final judgment on the results of the two systems.

56,379. I understand from your note that you have a number of agricultural advisers. Who are they and where were they trained?—You are referring now to the agricultural advisers in India.

56,380. Yes?—They are trained at the Universities. A good example was the late Mr. A. B. Modak, who had studied for twelve years at Poona College, and we secured the services of a number of friends of his who had also studied at Poona and other colleges.

56,381. They are all graduates from agricultural colleges in India, are they?—From the agricultural colleges, yes.

56,382. Are all the 109, at present employed by your Indian agency, graduates?—I do not say they are all graduates.

56,383. They are students from agricultural colleges?—Yes, some of them would certainly be students. They are all people who have passed a longer or shorter time at agricultural colleges. We are finding great difficulty in getting sufficient trained men.

56,384. What salary do you give to the agricultural adviser?—That varies a good deal, but you can take it that the expense of the man and his moving about is somewhere between £60 and £80 a year.

56,385. Who supervises their work? Have you any central office from where the work is being directed now?—We have the Central Office in Calcutta which is supervised by Mr. Hutchinson, and we are proposing to create branch offices or, at any rate, to have inspectors in Madras, Bombay, Karachi, and probably other places.

56,386. You say you have a training station which you have recently started near Calcutta?—Yes. That is a small training school in order to try to multiply the number of trained Indian demonstrators.

56387. Do you utilise the co-operative societies for the purpose of effecting sales?—Sales have been made to the co-operative societies.

56,388. You have not extended that activity very much, have you?—We are quite prepared to work with the co-operative societies and to support them, provided that the result, in the long run, to the ryot is as favourable as the result of our own system of retail selling up-country.

56,389. You would be prepared to give credit to the co-operative societies, would you?—We are prepared to do that, yes.

56,390. What happens to the bulk of the sulphate of ammonia which is produced in India now?—The bulk of it is consumed in India. The total production is about 13,000 tons to 15,000 tons a year. Something like 10,000 tons is actually being consumed in India. The balance goes to Ceylon.

56,391. Complaints have often been made that the percentage of free acid in the sulphate of ammonia produced in India is excessive. Is that so?—That was the case some years ago, until the Indian producers joined the British Sulphate of Ammonia Federation. We were able then to give them the benefit of our working experience here, and I think I am right in saying that practically the whole of the Indian output of sulphate of ammonia is now free of this free acid. It is all of neutral quality.

56,392. Of recent times, there has been a considerable increase in the sale of artificial fertilisers in India. Can you give the Commission figures illustrating the consumption of sulphate of ammonia, for instance, by planters and by ryots?—The bulk of the consumption in India is still by planters. Out of the 10,000 tons which I have just mentioned, about 2,000 to 3,000 tons would be consumed by ryots, the balance being consumed by planters; but we hope and expect that those figures will be reversed very shortly.

56,393. The tendency to increased consumption by ryots is quite noticeable, is it not?—Yes, certainly.

56,394. Have you any information to give the Commission as to the Provinces in which you find that tendency quite distinct?—The greatest progress so far has been made in the Bombay Deccan in the irrigated sugarcane growing districts. And wherever you have irrigation you will find that the sale of fertilisers proceeds more quickly than where there is no irrigation.

56,395. Is that the case in the Punjab?—To a much more limited extent.

56,396. On page 483 you estimate that in a few years' time the total consumption of fertilisers will be about 500,000 tons?—I was trying to indicate there the sort of possibilities there are in regard to India. We have received from India estimates far in excess of that figure, estimates showing a possible sale of 3,000,000 tons of ammonia sulphate a year. Very great deductions have to be made from figures of that kind, however.

56,397. If the consumption amounts to something like 150,000 tons of nitrogen, then you say there is room for production of synthetic nitrogen in India, and not till then?—Under present conditions I should say, yes to that question. Of course it will depend on the level of nitrogen prices in Europe as to whether it is going to be profitable, even then, to make nitrogen synthetically in India.

56,398. Reference has been made to natural fertilisers. In China they use night-soil. To what extent has night-soil been replaced by artificial fertilisers?—The habit of using night-soil is an immemorial one, and I

should not like to say that the effect of the introduction of artificial fertilisers has been to diminish the use of night-soil. I should rather say that artificial fertilisers have been used to supplement the night-soil.

56,399. It has been represented to me that the use of sulphate of ammonia with night-soil tends to kill hook-worms which may exist in night-soil. Is that so?—We made some experiments in China in that respect, and we found that if a certain solution of ammonium sulphate were added to night-soil it did kill the hook-worm.

56,400. Going back to India once more, I should like to ask you about freight rates. You refer to the necessity for lower freight rates on the railways. Have you any suggestion to offer on the reduction of rates?—There is a certain difficulty in regard to that. I think it must be admitted perfectly frankly that if you compare the Indian railway rates per ton per mile with the rates in Europe and in this country, the advantage lies entirely with the Indian rates; that is to say, the Indian rate is very much lower; but that really is not quite a fair comparison. What you want to do is to compare conditions in India with conditions in a very large country like Canada. I think the lesson one learns from perusing the Canadian rates is that the Canadian railways are willing to make exceptional rates in exceptional circumstances; that is to say, if they can be assured that the traffic is likely to increase they are willing to give specially favourable scheduled rates. If the Indian railways were more ready to grant scheduled rates, which in themselves are quite satisfactory, I think a great deal could be done to assist fertilisers. Of course, in India the present rates on small quantities, on 1-ton lots, are very high compared with the rates on truck loads. We are trying to get over that difficulty by consigning nothing less than a truck load to our depots. That, of course, in some cases involves us in extra expense, because we have to store the goods there. But I would rather hesitate, at this stage, to recommend a lowering of the rates on small quantities in India, because one does realise how important it is to get the traders to fill up a whole truck wherever possible.

56,401. You suggest that the Commission should recommend that preferential and favourable rates should be granted on the transport of fertilisers. What have you in mind when you suggest this?—I understood at the time that that was written that fertilisers were not always in the lowest class of goods in India. What I had in mind there was that fertilisers should always, on all occasions, be put into the lowest class of goods.

56,402. You make a reference to Egypt in your note of evidence. I understand that in Egypt the Government buy the fertilisers from you and then distribute them?—Yes. The Egyptian Government issue tenders for fertilisers, which run into very large quantities. They buy anything up to 20,000 tons of Chilean nitrate of soda, and similar quantities of superphosphate, at a time. They buy those quantities outright, and then they convey the fertilisers to a central store at a port or up-country, and they distribute them themselves on the system which I have outlined in my note of evidence.

56,403. Do the Egyptian Government pay you on three-months overdrafts, or do they pay you outright?—They pay outright, within a fortnight of the arrival of the goods at Alexandria.

56,404. Do you know what organisation they have set up through which they distribute the fertilisers to the actual cultivators, and realise the money?—I have indicated the machinery in my first note of evidence. They get the chief man of the village to certify that the cultivator is a fit person to receive the fertiliser, and then they have a complete control over the cultivator, because they collect the money for the fertiliser when they collect the land tax; and there is a system of administrative seizure if the cultivator fails to pay.

56,405. *Dr. Hyder*: Is it known to you that if the crop does not mature, the Egyptian Government has to forego the land tax?—Yes. I was aware of that.

56,406. And do you lose your money also?—No. The Egyptian Government pays for the fertiliser, and takes its chance with the crop.

56,407. *Professor Gangulee*: Can you tell us whether the time has come in India for any Act for the purpose of preventing adulteration of fertilisers?—That is rather a difficult question. An Act certainly could do no harm, I think. Whether it will do any good remains to be seen, because you are dealing with such very different conditions from the conditions with which you are dealing here. I think the best safeguard at present is that the sale and distribution of fertilisers in India is in the hands of a few comparatively large bodies which can follow out their sales right from the point of manufacture here to the point of sale to the actual ryot. That is a certain safeguard; but supposing you get the fertiliser trade in India becoming a very popular one, with the incursion of a very large number of small merchants and people who buy outright from producers or middlemen and who sell, then undoubtedly there will be a tendency towards adulteration, and probably the only way of safeguarding that would be to register the dealers in fertilisers and to subject their stores to regular inspection.

56,408. *Mr. Calvert*: With regard to this £ for £ offer, the £ from other sources need not necessarily come from Government, I understand?—Oh, no.

56,409. It can come from any source?—Yes.

56,410. On the question of the local manufacture of nitrogen, your 150,000 tons minimum is only a quarter of a cwt. per irrigated acre in the Punjab, is it not?—Yes. I know it is a very small figure compared with the possible total acreage.

56,411. The expansion of the use of sulphate depends largely on price, does it not?—Yes.

56,412. Do you think it worth while exploring that further, with the possibility of local manufacture?—I think it is always worth exploring, especially if you are going to have a condition of affairs in which there may be what I may call surplus power available. That would certainly alter the economics of the proposition.

56,413. The map on the wall shows the line of density of population. It is the same thing as the line of intensive cultivation. You have not to go far beyond Calcutta before you strike a point which is 750 miles from any port, and beyond 750 miles or even 500 miles you are reaching a point where freight charges become too heavy. Do you think, therefore, it is beyond all reasonable possibility for local manufacture to be started?—I would hesitate to express a definite opinion on that subject. You would want very careful investigation by fully qualified technical people.

56,414. But in the absence of such local manufacture, do you think it likely that prices will be so reduced as to bring fertilisers within the reach of those outlying districts?—There has been an enormous reduction in the price, especially of nitrogen, during the last four or five years. To-day, ammonium sulphate is being sold at something like 230 rupees a ton in the interior. Four or five years ago it was nearly double that. I do not pretend for a minute to say that we have reached the lowest possible price for nitrogen. I think probably prices will go still lower. Then it becomes purely a question of economics as to whether the cost in India is lower than the lowest possible cost in Europe plus the freight charges; and a very important feature in that connection is the amount of concentration of the fertiliser.

56,415. *Mr. Kamat*: With regard to employing trained Indians for the distribution of your product, you said there was some difficulty in getting men?—Yes, that is the case.

56,416. What sort of qualifications do you expect in those trained men?—You want a man who has gone through a course at an agricultural college, and who has therefore, a working knowledge of agriculture and of the elements of agricultural chemistry.

56,417. Are you quite sure that your best man, the late Mr. A. B. Modak, was an agricultural graduate?—He told me that he had studied at Poona college for 12 years.

56,418. Was he an agricultural graduate?—I understand he was. He was a pupil of Dr. Mann at Poona.

56,419. I am not sure that he was an agricultural graduate, but the point is he was a very capable shrewd man of business, which is really what you want. On page 474 you say "We seek no monopoly, and we are prepared to co-operate with other fertilisers interests in India"?—Yes.

56,420. At the present moment is it not a fact that you hold a practical monopoly in fertilisers?—No. I do not think that is correct, because, for example, the Chilean Nitrate Committee has a propaganda office in India, and the Cyanamide people have an organisation called Fertilisers Sales Limited, which is doing propaganda work in India.

56,421. Is it a fact that sulphate of ammonia turned out at Tata's factory is sent out of India?—Some of it goes to Ceylon at the present moment, and it is quite conceivable that it might be more economical to export a certain amount of the sulphate of ammonia which is produced immediately north of Calcutta, rather than to send it very far into the interior of the country, because it is possible that we might be able to reach certain points in the country from here more cheaply than the railway rates charged from that place.

56,422. Do they export to Java?—They used to, but they have not exported to Java for years now.

56,423. They have joined your Federation I think?—They have.

56,424. In your scheme you suggest that the Government should partly finance the purchasing of sulphate of ammonia for purposes of distribution?—I suggested that as one possible means of the distribution of fertilisers.

56,425. This morning we had a suggestion that the Government of India should finance the purchase of implements from British manufacturers. You are making a similar suggestion in regard to fertilisers. Do you think it is a sound general principle of policy that the Government should come in to aid in the matter of financing a particular industry?—It depends very much on the particular conditions. There again, I would like to refer to the experiment which is being made in the Sudan. Under the conditions such as you have them there, I should say it was very sound for the Government to do such a thing. In Egypt, under the particular conditions which had grown up there before the Government intervened, I should also say it was quite sound from a public point of view. But in this country of course a proposition of that kind would probably be entirely unsound.

56,426. In Egypt, do they buy only your product?—Oh, no.

56,427. And shut out others?—Oh, no. In fact our particular product, ammonium sulphate, is only a very small item in the total fertiliser requirement of Egypt. The nitrate form of nitrogen is more suitable for Egyptian soils.

56,428. As you say you do not seek a monopoly, your suggestion therefore comes to this: the Government of India or the Local Government should purchase, on the Egyptian model, any fertiliser they choose, or different fertilisers in different proportions?—The Government would naturally be guided by advice from its scientific advisers as to what purchases were required, from whatever sources, and from the cheapest source available.

56,429. Then, how would that scheme help your Federation if the Government were allowed the fullest possible liberty to buy any fertilisers they liked?—We are prepared to take our chance.

56,430. You also suggest some other facilities in the matter of discounting by the banks of trading bills?—That is a system which is at present being very successfully employed in Germany. Something like two-thirds of the nitrogen business in Germany at the present time is being done on three months acceptances which are discounted by the Reichs Bank. That system has worked admirably in Germany.

56,431. You further suggest that a percentage of any bad debt should be borne by Government. Do you think that is also sound?—Our experience of agricultural trade is that the bad debts, on the whole, if you are reasonably careful do not form a considerable item in the bill; but, of course, in dealing with a country like India the conditions are very different, and I was merely suggesting that the Government should, in that case, bear a definite percentage of any bad debts which occurred in order to enable the trader to make a lower initial price. If he knows that the Government is not going to bear any portion of the debt, he will naturally try to cover himself by raising the price for credit.

56,432. This principle of sharing liability with a private firm or a federation seems to me rather too large an order for a country like India! Regarding your suggestion to have a special central bureau for fertilisers, do you mean to say the present machinery of Government in India is inadequate to do the task which you suggest?—I would not like to suggest that. All I am saying is that the present machinery, if it exists, has not been used to the required degree.

56,433. You want a special officer, with the Central Government, to investigate fertilisers. That is exactly what it comes to, is it not?—Yes. I think it is absolutely necessary that there should be a special department and a whole-time officer to deal with fertilisers, because experience has shown that if fertilisers are simply left as one of the problems which have to be dealt with by the chiefs of the agricultural stations, fertilisers are rather apt to become the Cinderella of the piece.

56,434. *The Chairman*: You are not impressed by the work already done in fertilisers; is that the position?—I would not like to put it in that way. I do not want to appear to be casting any reflection on the agricultural departments. All I say is that not enough work has been done. My impression is that they have been too over-worked to do it.

56,435. *Mr. Kamat*: There are other factors, as well, which other people think are also the Cinderellas of the Government of India. It would be very difficult to give preference to one particular factor in agriculture as against another, would it not? Do not you imagine that that is a difficulty?—I should say it was a question of the relative importance of the various factors, and it seems to us that fertilisers are a factor of supreme importance.

56,436. *Sir Henry Lawrence*: You send out these products packed in *maund* bags with jute covers. How long will they keep without deterioration?—A fertiliser like ammonium sulphate does not deteriorate at all.

56,437. Not even if exposed to wet?—There will be a certain variation in weight. If it is exposed to wet there will be a certain increase in bulk, but the percentage of nitrogen is fixed and constant. If it is not brought into contact with lime, for instance, or something which will make the nitrogen or ammonia escape, no loss will occur.

56,438. So that they can be stored in up-country depots without very great care or expense?—Yes, quite easily.

56,439. For an indefinite period?—Yes, quite easily.

56,440. *Sir Thomas Middleton*: The object of your Central Office, I take it, is to bring into direct touch your own staff and the representatives of the departments who work for the spread of fertilisers in India?—That is one of the objects.

56,441. It seems to me that it is the main object which you have in view? —The main object we have in view is really to get the whole fertiliser work in India very much better co-ordinated.

56,442. You want to bring all the interests together with the object of co-ordinating the work?—Yes.

56,443. I have some difficulty in seeing how you will accomplish your purpose of co-ordination by a Central Office such as you indicate. There is in India not one Central Department of Agriculture, but about a dozen departments of agriculture. It seems to me that if you want to get their work co-ordinated with your work, you must be in touch with each of them in their respective Provinces?— We thought the effect of the establishment of a Central Office, on which the Central Government itself and the provincial departments and the fertiliser trade would be represented, would be to give an impetus to research and experiment in the fertilisers, which impetus we could not hope to give if we, as an individual unit, tried to work directly with the provincial departments.

56,444. It is the provincial departments which are really engaged in using these fertilisers and in making experiments. The Central Government makes no experiments at the present time outside Pusa. It is just the same as the position in this country: there is the Ministry of Agriculture and Fisheries in England, there is the Board of Agriculture in Scotland, and in Ireland they have two similar departments. You have got to get into direct touch with each Province in India in the same way as you would approach the departments here. You state that it would be necessary to have at least one man, or more than one man thinking of fertiliser questions from the central point of view?—Yes.

56,445. I think you might want one man or probably several men in each Province to tackle the subject. The work involves important questions in crop production?—Yes.

56,446. I do not see where your Central Office is going to help you?—We assumed in this scheme that the staff and establishment of the provincial departments would be increased to such a point that they could carry out experiments and research on a very large scale. It does seem to us that, over and above that, you want some sort of co-ordinating office to see that all these experiments are being tried out on the same lines. I do not see how any purely private organisation like our own can approach the provincial departments in the confidence that it will receive their co-operation. It seems to me that unless you have some compelling force which, in our scheme, is represented by the Central Government, you may get a situation in which the provincial departments will say, " We do not want to co-operate with the fertiliser trade at all."

56,447. You want a letter of introduction from the Central Government? I do not know whether it would help you very much if you got it. Have you instances of any considerable quantities of sulphate of ammonia being used for other crops than sugarcane in India?—You are ruling out tea, of course?

56,448. I am ruling out planters' crops. I am thinking of the ryots' crops?—We have a certain amount of evidence with regard to irrigated cotton, and rather less with regard to rice. Sugarcane is the main crop at present. We think that irrigated cotton will be a very large consumer.

56,449. I see that you propose supplying mixed manures for such things as irrigated cotton and sugarcane?—Yes.

56,450. And that these mixed manures would be made of the most highly concentrated materials which you could get on the market here?—Yes. They would almost certainly be made at our air nitrogen works here. The simplest type of a mixed fertiliser would be a dual fertiliser like di-ammonium

phosphate, which would contain upwards of fifty per cent. of phosphoric acid and twenty per cent. of nitrogen.

56,451. That is a very much higher concentration than you could possibly get from ordinary superphosphate?—Much higher.

56,452. For potash, would you depend upon pure sulphate of potash, fifty per cent. quality?—Yes; mainly. You could also utilise chloride of potash.

56,453. The great difficulty which I see is the one which has already been pointed out, namely, the cost of transporting manures of this sort to such places as the Punjab. The freight charges would be very heavy?—Yes, but that would be met to a very large extent, I think, by the introduction of dual fertilisers and triple fertilisers. With the dual fertiliser you would require four tons of ammonium sulphate and superphosphate to make up one ton of a concentrated fertiliser such as I have just referred to, so that the saving in freight in that case would be enormous.

56,454. That is what I wanted to bring out.—We have not to look at the cost here, or at the cost at the port in India; we have to look at the cost on the ryot's land.

56,455. It is the case, is it not, that the possibility of producing these highly concentrated manures is the result of quite a recent development in the manure trade?—Yes, that is so.

56,456. You say that you hold stocks of sulphate of ammonia. Does the holding of stocks not present a great difficulty? To what extent can you hold stocks of sulphate of ammonia? I am thinking now of the War difficulties of storage of sulphate of ammonia?—During the greater part of the War you had acid ammonium sulphate containing up to one per cent. of free acid which rotted the boxes in storage. That difficulty has now been completely eliminated. We are producing a product now which contains only a trace of free acid; it is less than .025 per cent. When you get a product like that there is no physical difficulty whatsoever about storage.

56,457. I was thinking of the other War difficulty, that of financing the storage. That must be a big problem?—Yes, that is a problem, and that is why I intimated in my memorandum that when you get into millions of tons probably some special arrangement would require to be made to finance these quantities; but at present that problem is not a serious one for us. We have to keep a stock somewhere, and we might just as well keep it in India.

56,458. But if you ran into this 500,000 tons, there would be much financing to do?—Yes, there would. Finance then would play a very important part.

56,459. You are rather guarded, I see, in your estimate. You say, "It is not impossible that the total may reach 500,000 tons in ten years." I do not think you expect it to, do you?—I made an armchair calculation, on which I arrived at a very much bigger figure. From our limited experience in India, it is quite clear that one has to be very cautious in making any estimate.

56,460. In the last ten years we in Britain have increased our consumption of sulphate of ammonia from 60,000 to 170,000 tons, a three-fold increase. We can hardly look for a fifty-fold increase in the next ten years in India, can we? You made use of the expression that an Act to regulate the trade in fertilisers could at least do no harm, but you indicated the great difficulty of enforcing the Act and controlling the sale of fertilisers as it is controlled in this country. If you have an Act which is not enforced, do you not think it would do more harm than good? Honest traders would conform to it, but others would not. It would only hit the best class of trader?—If you registered them and inspected them they would not be able to do it.

Yes, but that means expensive machinery.

56,461. *Dr. Hyder*: Referring to your appendices, you will admit that the improvement which you claim by the use of fertilisers depends not only upon the efficiency of the fertilisers, but also upon the price of wheat or whatever the crop may be?—Quite so.

56,462. There are two sides to the question, firstly the price of fertilisers and their capacity for increasing the product, and secondly, the price of the commodity itself. The percentages which you set out in your appendices are based on a certain assumption with regard to the stability of two sets of prices?—Yes. The price relation must always be a favourable one. The economic factor is always of supreme importance in the ultimate result. It is not the slightest use trying to get a ryot to use a fertiliser even if you tell him he is going to get forty per cent. increase when that forty per cent. increase will not give him an economic result.

56,463. *Mr. Noyce*: Am I right in understanding that your Federation now handles the whole of the sulphate of ammonia turned out at Jamshedpur?—Yes, the whole of it.

56,464. With regard to high railway rates, have you worked out the rate per ton mile in Canada as compared with the most favourable rate in India?—Yes, I have worked it out. If you take the Indian schedule rate, the most favourable Indian rate, and the most favourable Canadian rate, they are on about the same level.

56,465. So that there is not much scope for further reduction in India?—No, except that the schedule rates, as I understand, are not very universally applied. If you take the standard rate in India, then the rate is very much higher than it is in Canada. For instance, here is an example: 832 miles in Canada at 33s. 1½d. per ton, and the same distance in India 65s. 7d. per ton. That is on the ordinary classification rate, but there is a schedule rate in India for 1,000 miles of 30s. a ton. Therefore, if the schedule rates were applied more frequently, that would help us out of the difficulty.

56,466. *The Chairman*: On which railway is that standard rate?—This is the North-Western Railway.

56,467. *Mr. Noyce*: If I recollect correctly, the scheduled rates vary between a maximum and minimum. What you call the standard rate must be somewhere between the two. Is that so? What you want is the minimum rate permitted by the schedule applied, I take it?—I was under the impression that the lowest rates of all were what are called scheduled rates.

56,468. *Sir Thomas Middleton*: Is Java taking much sulphate of ammonia?—The consumption is about 110,000 tons per annum. It is not increasing much because the Government there have to prevent more than a certain acreage being grown under sugar each year in order to set free enough land to gow rice for native consumption. So we do not expect any very large increase in Java.

56,469. Is Spain taking much more than before the War?—Spain has increased enormously. It uses 160,000 tons a year now.

56,470. Is that for rice?—For oranges chiefly, and also for rice.

56,471. *The Chairman*: The exports from India of, for instance, sulphate of ammonia exceed the imports into India of the same commodity, do they not?—I do not think so to-day. They did a few years ago. There was an import for 1925-26 of 5,700 tons from this country, and out of a total quantity of 13,000 tons produced there was consumed locally nearly 9,000 tons, according to the figures I have got. This year we estimate that the total consumption (that is to say, for the fertiliser year ending the 31st

May) was about 10,000 tons in India, and of that about 2,000 tons was imported from Great Britain and the United States, and about 2,000 tons of Indian production was exported to Ceylon.

56,472. How do you compare the quality of the sulphate of ammonia exported with that imported?—At present it is practically the same, because the Indian makers are now making neutral quality, the same quality as we are making.

56,473. Then how do you account for the fact that there is this export of sulphate of ammonia from India in face of the local demand?—Because of the enormous distances. The whole of the production in India is concentrated about 100 miles to 150 miles north-west of Calcutta. It is a question of freight.

(*The witness withdrew.*)

The Commission then adjourned until 10.30 *a.m. on Tuesday, the* 28*th June*, 1927.

Tuesday, June 28th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Lieutenant-General Sir WILLIAM FURSE, K.C.B., D.S.O., Director, Imperial Institute, London.

NOTE OF EVIDENCE.

PART I.—CONSTITUTION AND FUNCTIONS OF THE IMPERIAL INSTITUTE.

Under the provisions of the Imperial Institute Act of 1925, the Institute has been reorganised and placed under the control of the Department of Overseas Trade. The Parliamentary Secretary of that department is the responsible Minister and is Chairman of the Board of Governors. This body consists of the High Commissioners of the Dominions and India, representatives of the Colonial Office and other Government Departments, and of the Crown Agents for the Colonies, with additional members representing scientific and commercial interests.

Functions of the Imperial Institute.

The report of Mr. Ormsby Gore's Committee on the Imperial Institute, which was adopted by the Imperial Economic Conference of 1923, stated that:

> "116. (4) The most essential function of the Imperial Institute is that of a Clearing House for collecting and disseminating information, and for conducting through the appropriate scientific, technical and commercial organisations, enquiries and investigations regarding the raw materials of the Empire.
>
> (5) The work of preliminary analysis and technical investigation of raw materials carried on in the laboratories of the Institute is almost as important, and should be retained."

The purposes of the Institute, as defined in the first schedule of the Act of 1925, are appended.

Present organisation.

For the purpose of carrying on the work of the Institute two principal departments have been established, viz., a Plant and Animal Products

Department and a Mineral Resources Department. An Advisory Council for each of these groups of products has been appointed, Sir David Prain, C.M.G., C.I.E., F.R.S., being Chairman of the Plant and Animal Products Council, and Sir Richard Redmayne, K.C.B., Chairman of the Mineral Resources Council.

Advisory Council and Technical Committees.—The principal functions of the Advisory Council on Plant and Animal Products are to advise the Institute on all matters relating to the utilisation of these groups of Empire raw materials and to initiate schemes of work which might be undertaken by the Institute. In order to facilitate this work, the Council has appointed a number of advisory technical committees to deal with special subjects on the lines of the Institute Committees on Silk and Timbers which were established in 1916. The committees at present constituted are are follows.—

Subject.	*Chairman.*
Silk.	Sir Frank Warner, K.B.E.
Timber.	Mr. H. D. Searles-Wood, F.R.I.B.A.
Vegetable Fibres.	Mr. Alfred Wigglesworth.
Animal Fibres.	The Hon. Sir George Fairbairn.
Oils and Oil-seeds.	Dr. A. W. Hill, C.M.G., F.R.S.
Essential Oils and Resins.	Mr. A. Chaston Chapman, F.R.S.
Tanning Materials.	Sir David Prain, C.M.G., C.I.E., F.R.S.

Committees on other products will be formed as and when required.

Each of these committees has a member of the Advisory Council as Chairman and includes scientific and technical authorities as well as representatives of the trades and industries concerned in the particular group of products. Lists of the members of the Advisory Council and of the several committees are attached (Appendix 2).*

The High Commissioner for India is represented on the Advisory Council by Mr. H. A. F. Lindsay, the Indian Trade Commissioner, who is also a member of the Committees on Silk, Vegetable Fibres, Oils and Oilseeds and Essential Oils and Resin. Sir Peter Clutterbuck has also been nominated by the High Commissioner to be a member of the Committees on Timbers and Tanning Materials.

Intelligence Section.—This section of the department deals with enquiries for technical and commercial information respecting the production, utilisation and marketing of Empire raw materials of plant and animal origin. The section is also responsible for the collection and indexing of published and other information on plant and animal products which is likely to be of service in connection with the above-mentioned enquiries and the work of the department as a whole. During the year 1926, the Intelligence Section dealt with 929 enquiries, varying widely in scope and character, and emanating from, or relating to, many different parts of the Empire.

Investigations Section.—This section undertakes the chemical and technical examination of Empire raw materials with a view to determining their composition and value, and the possibility of their utilisation in industry. Small scale trials are made in the case of promising materials. The investigations are not carried beyond this point and no purely scientific research is undertaken. During 1926 reports were furnished on 490 samples,

* Not printed.

most of which were received from Government Departments of Agriculture, Forestry, or Industries, in practically every country of the Empire.

Bulletin.—Information relating to the production and utilisation of raw materials is disseminated through the medium of the quarterly Bulletin of the Imperial Institute which contains records of the principal investigations conducted for the Dominions, Colonies and India at the Imperial Institute, and special articles, notes and abstracts, chiefly relating to progress in tropical agriculture, the development of mineral resources, and the industrial utilisation of all classes of raw materials.

Public Galleries.—These galleries form a permanent exhibition illustrating the natural resources and scenery of the Dominions, India and the Colonies and the life of the people. Since the re-organisation of the Institute the galleries have been re-decorated and the exhibits re-installed on a new basis with a view to rendering them more attractive to the general public, especially the younger generation, and of greater educational value. A special feature has been made of pictorial representation, including illuminated dioramas, transparencies and photographs, and a cinema has recently been constructed for the display of Empire films with funds provided by the Empire Marketing Board. Conducted lectures and demonstrations are given daily by the Guide Lecturers to school teachers, children and associations.

Further improvements in the galleries are contemplated and it is hoped to form a comprehensive and attractive exhibition under one roof which will convey to visitors an adequate and accurate representation of the resources and possibilities of all the overseas countries of the Empire.

Colonial Scientific and Research Service.—In connection with the organisation of the Imperial Institute, reference may be made to the resolutions adopted by the recent Colonial Conference in London regarding the establishment of a Colonial Scientific and Research Service. The scheme, which was approved in principle by the Conference, provides, *inter alia*, for the appointment of a Central Agricultural Research Council in London, including a representative of the Imperial Institute, to advise the Secretary of State on the following matters:—

(*a*) The broad lines on which research in the Colonial Empire should be carried out.

(*b*) The establishment and maintenance of such of the proposed Empire chain of research stations as are to be situated in the Colonies, and the maintenance of liaison with the Empire Marketing Board in this task.

(*c*) The creation of a clearing house of information.

(*d*) The organisation of a small pool of scientific workers.

(*e*) The organisation and general principles of administration of a Colonial Agricultural Research Service including questions relating to study leave.

It is further proposed that the offices of the Council should be situated at the Imperial Institute.

Should this scheme come into operation the Institute will be brought into closer touch with the agricultural research conducted in the Colonies and Protectorates, and would therefore be in a position to serve as a clearing house for information as to the activities of the various Colonial agricultural departments and research institutions. This information could not fail to be of value to the agricultural departments in India and the Dominions, and the scheme would therefore greatly enhance the value of the services which the Imperial Institute can render to India.

PART II.—ASSISTANCE WHICH THE IMPERIAL INSTITUTE COULD RENDER TO INDIAN AGRICULTURE.

In considering this question, it should be borne in mind at the outset that the principal functions of the Institute are to serve as a clearing house for information relating to the production and utilisation of the raw materials of the Empire and to provide for the preliminary investigation of such materials in its laboratories. The Institute is not primarily concerned with the methods of cultivating the various crops, but rather with the products themselves, and deals specially with questions relating to their composition, quality, suitability for industrial or commercial use, marketing, and to the methods of preparation as affecting the quality and value.

The Institute therefore does not undertake to advise on the purely agricultural problems involved in the production of the various crops in India or to carry out research thereon, this work being the recognised sphere of the agricultural departments and research institutions in India or this country. The direction in which the Institute can assist Indian agriculture is in connection with the utilisation and marketing of Indian products, by supplying technical or commercial information relating to particular products; by undertaking, if desired, the preliminary examination of Indian raw materials; or by investigating through the appropriate Technical Committee or in association with manufacturers the industrial possibilities of such materials.

Such enquiries and investigations can, in many cases, be best carried out in this country, and the Advisory Council on Plant and Animal Products and its associated technical committees, in conjunction with the Intelligence and Laboratory Sections of the department, constitute an organisation specially designed for this work. The Institute will therefore welcome enquiries relating to any products which may be under consideration by Agricultural Departments in India.

The Institute is now in close touch with Government departments and other institutions engaged in research, and, when necessary, materials requiring scientific investigation, or specialised enquiries, are at once passed for action to the appropriate body.

The nature of the assistance which the Institute can render to India may be best illustrated by examples of recent work on Indian products.

TECHNICAL COMMITTEES.—These committees have dealt, or are dealing, with the following Indian questions:—

Silk Committee:
Indian Silk (Report to Government of India).
Assistance to silk industries in Mysore and Kashmir.
Market for Indian eri cocoons and waste silks.

Timbers Committee:
Indian timbers (Report to Government of India).
Utilisation of Indian woods as standard timbers for motor body construction and for other purposes.
Indian timbers for axe and tool handles.

Vegetable Fibres Committee:
Indian hemp; improvements in preparation and marketing.

Oils and Oilseeds Committee:
Assistance in connection with establishment of demonstration oil-mill in the Punjab.

Tanning Materials Committee:
Utilisation of Indian tanning materials in this country.
Deterioration in the quality of East Indian tanned hides.

INTELLIGENCE.—During the period 1st January, 1926, to 31st May, 1927, the Institute furnished information to Government officers and others in India on a variety of subjects of which the following are examples:—

Director of Agriculture, Burma:
(1) Equipment for manufacture of citrus products, the best varieties of lime to plant, and marketing of products; (2) preparation and marketing of papain; (3) machinery for manufacture of "puffed" rice.

Director of Industries, Punjab:
(1) Essential oil plants for cultivation in the Punjab and particulars and prices of suitable stills; (2) utilisation of waste bones and blood.

Director of Industries, Travancore:
(1) Manufacture of "pearl" and "flake" tapioca and grading of the products; (2) value in London of native-made baskets and hats; (3) machinery for lozenge manufacture.

Forest Research Institute, Dehra Dun:
(1) Production of power alcohol in Australia and South Africa; (2) sources, characters and market values of a number of essential oils; (3) market position and prospects of "rosha" oil.

Chief Chemist, Gwalior:
Importers and users of cutch who might be interested in supplies from Gwalior.

INVESTIGATIONS.—During the same period the following investigations of Indian products were carried out in the Laboratories in order to determine their industrial or commercial possibilities.

Indian Trade Commissioner in London:
Ficus elastica rubber; fibre.

Director of Fisheries, Madras:
Sardine oil.

Director of Industries, Travancore:
Kapok; kapok seed; tanned goat skins.

Other investigations related to the comparative strength of twines made from Indian and European hemps in connection with the enquiry of the Fibres Committee; camphor and camphor oil from Burma; origanum oil from Madras; and *Terminalia Arjuna* bark.

Public Galleries.—The Indian Court in the Public Galleries could be made of much greater value if the exhibits were brought up-to-date and the methods of their display improved. In both these respects the Court compares most unfavourably with those of many other countries, such as that of New Zealand, which is situated in the adjoining gallery. Unfortunately, the Government of India withdrew its annual contribution to the upkeep of these galleries in 1923. Without this special contribution it is impossible for the Institute to meet even the overhead charges of the galleries, much less to reorganise the exhibits in the Indian Court, as is being done for the Dominions and Colonies.

APPENDIX.

IMPERIAL INSTITUTE ACT, 1925.

First Schedule.

PURPOSES OF THE IMPERIAL INSTITUTE.

1. To promote the commercial industrial and educational interests of the British Empire.

2. To collect and disseminate:—

(*a*) information relating to possible uses of and markets for new raw materials or semi-manufactured products;

(*b*) information relating to new uses of and markets for already known raw materials or semi-manufactured products;

(*c*) information relating to sources, production, supplies, cost, consumption and requirements of raw materials and semi-manufactured products and legislation relating thereto;

(*d*) information relating to the best means of increasing supplies or of creating new sources of supplies of such materials and products within the Empire;

(*e*) information relating to the best means of treating such materials and products and of preparing them for marketing;

(*f*) technical and scientific information bearing upon the industries of the British Empire.

3. To advise on the development of the resources of the Empire in raw materials in order that such resources may be made available for the purposes of industry and commerce and of Imperial defence.

4. To conduct in the laboratories of the Institute preliminary investigations of raw materials and when it may be deemed advisable to arrange for more detailed investigation by appropriate scientific or technical institutions.

5. To collect samples of raw materials having a definite value in industry and commerce.

6. To co-operate with other agencies within the Empire formed for similar purposes.

7. To maintain for public information and instruction, in the exhibition galleries of the Imperial Institute, exhibitions illustrative of the resources and development of the Empire and of its scenery, life and progress, and, where practicable, to organise from time to time temporary exhibitions of a similar nature elsewhere.

8. To do anything incidental to or conducive to carrying into effect all or any of the foregoing purposes.

Lieutenant-Colonel Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S., formerly Superintendent of Cinchona Cultivation in Bengal.

NOTE ON CINCHONA BARK AND ITS ALKALOIDS.

European acquaintance with Peruvian bark has been traced to the cure in 1638 of a vicereine of Peru, who had contracted malaria, and whose name is perpetuated in that of the genus *Cinchona*. This bark became a forest product exploited in Loxa, now Southern Ecuador; it appeared first in a London pharmacopoeia in 1677.

Exploitation of forest products may lead to narrowed supply, increased cost, and substitution. After 1753 the red bark of *C. succirubra*, from Chimborazo in Northern Ecuador, competed with the pale bark of

C. officinalis from Loxa, which its exporters now termed crown bark. Europe thought red bark, although cheaper, as useful as crown; red became, and still remains, the only cinchona bark recognised as officinal. Trade substitution did not end here; the grey barks of *C. micrantha* and *C. nitida* from Huanuco in Central Peru competed with red, and their exploitation extended so as to include the yellow bark of *C. calisaya* from Bolivia. Scarcity of yellow bark led to the commercial exploitation of Colombian bark, obtained from *C. lancifolia*. As this was the last bark of importance to pharmacy that the rain forests of the Andes could supply, Europe undertook the cultivation of cinchona.

Conversion of forests products into crops is subject to limiting factors. When labour is unprocurable, the crop must go where labour exists. France tried this crop in Algeria in 1849; Holland tried it in Java in 1851; England did so in Ceylon, the Nilgiris, and the Eastern Himalaya in 1861.

After labour comes environment. The soil and climate of Algeria did not suit cinchona; those of Java proved satisfactory. Ceylon and South India provided a suitable climate but a less satisfactory soil; in the Himalaya even the climate is marred owing to there being a distinct dry season.

After environment comes adaptability. Colombian bark is unwilling to thrive, even in Java. Red bark and grey prove accommodating, even in the Eastern Himalaya. Yellow bark can be planted in the Eastern Himalaya; it refuses to thrive in most parts of South India.

There are limiting factors connected with utilisation as well as with production. Among the 40 cinchonas of the Andes, only six have proved of importance to pharmacy because of the alkaloid-content of their barks. Even in these important barks the alkaloid-content may vary naturally; three per cent. means a poor, six per cent a good, nine per cent. or over, a rich sample. Under cultivation, environment may induce further variation; barks "rich" in Java may be only "good" in South India or the Himalaya. This alkaloid-content factor has not inhibited the cultivation of any kind of cinchona; it has, however, rendered the careful selection of strains essential. The equally careful selection of kinds that, under existing conditions, are imperative, depends on the allied factor of alkaloid nature.

The alkaloids of cinchona bark may be amorphous or crystallisable. All are remedial against malaria, the physiological action of the amorphous being more rapid than that of the crystallisable, and the efficiency of the crystallisable being accentuated when administered in an uncrystallised state. The chemical relationship of the amorphous to the crystallisable alkaloids is less clear than the inter relationships of the crystallisable, whose remedial powers are believed to differ.

The crystallisable alkaloids in officinal cinchona bark were separated collectively for the first time in 1815. In 1820 this collective derivative yielded the specific alkaloid known as quinine; by 1852 it became known that, besides quinine, the "cinchonino" of 1815 includes other alkaloids—cinchonine, cinchonidone, and quinidine. The relative proportions of these alkaloids in particular kinds of cinchona remain unaffected by the variation in their percentages. In any sample of red bark, one-half of the alkaloid-content is cinchonine, one-third quinine, one-sixteenth cinchoniline, only one-eightieth quinidine; the remainder—about one-eighth—is amorphous. But the relative proportions of these alkaloids differ in different kinds of cinchona bark. In red bark, quinine forms but one-third of the alkaloid-content; in crown bark it forms three-fourths. In yellow bark the proportion of quinine is higher than in crown; in grey bark that proportion is lower than in red.

When quinine was first isolated in 1820, yellow bark was the kind of most importance to pharmacy; quinine therefore became, and still remains, the

only cinchona alkaloid that is officinal. Being the officinal alkaloid, quinine is the one chiefly prescribed and the one chiefly separated from cinchona bark in the factory. The manufacturer, when purchasing bark, pays for it in terms of its quinine-content; the planter, when establishing a plantation, stocks it with the kind of cinchona his environment will permit to thrive, that is richest in quinine. It costs the manufacturer about as much to work up, and it costs the planter about as much to produce, a bark poor from the quinine standpoint, as it does to produce and work up a rich bark. The cinchona planter still grows some red bark because this is still required by pharmacy for officinal "bark preparations." But the quinine manufacturer no longer purchases red bark or grey, and the planter no longer raises any grey, nor will he grow crown if the environment and adaptability factors do not inhibit cultivation of yellow bark. Such, then, are the economic relationships of cinchona bark and its alkaloids.

These relationships are sometimes misunderstood. It has been said that bark production was abandoned in Ceylon because "cinchona, planted without scientific advice, began to deteriorate." It is believed that this has happened in South India owing to the establishment of a cinchona monopoly by Java. What happened in Ceylon was that, when coffee cultivation came to an end, cinchona cultivation was taken in hand. Ceylon, like South India, had to grow crown bark. When Ceylon began to harvest her cinchona the prices received were lower than the prices paid to Java for yellow bark. Ceylon, without hesitation, gave up cinchona and cultivated tea. The same economic factor has led to the abandonment of cinchona cultivation by private enterprise in South India.

What has been described as a cinchona monopoly in Java is no more than a quinine monopoly. That monopoly is not the creation of Java; it is a consequence of the fact that yellow bark, which does not thrive in South India, grows better in Java than in any area, outside Bolivia, where it has been tried. The preference of the planter everywhere for yellow bark is a result of the fact that the quinine-maker pays a better price for that bark. The action of the quinine-maker is itself a result of the accident that the hygienic relationships of quinine differ from those of the other alkaloids of cinchona bark. These hygienic relationships themselves appear at times to be misunderstood. Quinine may be the most valuable of the crystallisable alkaloids of cinchona bark; it certainly is not more valuable than the amorphous. Were this appreciated, we might be spared complaints as to the world-shortage of quinine. The manufacturer, who ought to know, seems to think these complaints exaggerated. Meanwhile the Java planter is less than content with the price he receives for his bark and explains that he cannot market all that he grows. This suggests over-production rather than shortage. Java, so far from establishing a monopoly, must have lost control of the bark market.

One consequence of this particular misunderstanding has been that our own dominions are unable to produce all the cinchona bark and its alkaloids that they require. To some, this does not appear a serious matter; shortage of a remedy for malaria lends vigour to the crusade against its cause. We can appreciate this feeling: "Prevention is better than cure." But others feel that, until malaria prevention has become more general, the provision of a recognised remedy remains a public duty. Medicine, therefore, urges the State to extend the cultivation of cinchona, within the Empire, wherever it can be grown.

The appeal of medicine might carry greater weight if fuller account were taken of the effect on the economic relationships of cinchona of its hygienic relationships for which she is ultimately responsible. Medicine does not overlook these entirely; she regards all the alkaloids of one kind of cinchona as worthy of use, so long as they remain unseparated from the bark. It

is only after the alkaloids have been separated from their bark that medicine feels constrained to regard all but one of them as unimportant. Even if it were true that quinine be a more effective remedy for malaria than its companions, it remains for consideration whether the treatment of these other alkaloids as waste products of no value be wholly justifiable. It is to this action on the part of medicine that the economic relationships which now exist owe their origin. If medicine can see her way to some modification of her present attitude, conditions that hamper State action and distress us all might disappear; full advantage could then be taken of cinchona bark and its alkaloids.

Lieut.-General Sir WILLIAM FURSE, K.C.B., D.S.O., and Lieut.-Colonel Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S.

Oral Evidence.

The Chairman: Sir William Furse, you are Director of the Imperial Institute, London; and Sir David Prain, you were formerly Superintendent of Cinchona Cultivation in Bengal. I will address myself first to General Sir William Furse.

56,474. In the second part of your note, Sir William, commencing on page 506, you outline the directions in which, in your view and experience, the Imperial Institute might render service to Indian agriculture. Has any advantage been taken of those facilities so far?—Yes, certainly. I think I can best answer your question by giving, in just the briefest outline, the different headings under which we have helped, and are trying to help India. First of all, we have a Silk Committee. The production of silk in India has much decreased, and, with important exceptions, the quality of the silk is below the standard which we find is required by the manufacturing market in England. We tried to help in the matter, and our Committee's recommendations were embodied in a Report on Indian Silk which was prepared in 1918 in connection with the Indian Trade Inquiry at the Imperial Institute. That Report was transmitted to the Government of India, and was subsequently published. Since then we have given practical assistance towards improving the silk production in Mysore and also in Kashmir; and as far as we can tell from the correspondence we have had, that assistance has been welcomed and made use of. With regard to timbers, a report was also prepared some years ago, in 1919, on teak and other Indian woods already established on the English market, and the Committee's recommendations included a number of new Indian timbers which were not known over here; and some of these have been marketed in this country in recent years. For instance, there is a London firm of motor body builders which has adopted a number of Indian woods as standard timbers for their construction of motor bodies. That was the result of trials conducted under the auspices of our Timbers Committee at the Institute. This Committee has also made enquiries as to the possibility of obtaining satisfactory supplies of oak from India for use in this country. It has just recently dealt with an enquiry referred to us, not from India but from the Admiralty, in connection with the use of Indian timbers for the new floating dock at Singapore; and some good, I think, might come out of that. We are also considering the question of utilising Indian timber at the present time for axe and tool handles in place of American hickory. I do not see at all why something valuable in the way of trade might not come out of that enquiry. Turning to the work of some of our new Committees which have been formed during the last twelve months under the Council, over which sits as Chairman Sir David Prain who is with me this morning, I may mention the Vegetable Fibres Committee. I need not tell you very much about that, because you have already had evidence only

the other day in connection with Indian hemp; but I think that is a very important question in which our Committee hopes to be able to help India. I think you have already been given evidence as to what we are doing with regard to trials in connection with the Admiralty and so forth, and I need not say anything more about that. Then we have an Oils and Oilseeds Committee. We had a request from the Director of Industries in the Punjab for information and advice regarding the equipment of a demonstration oil mill which it is proposed to erect in order to demonstrate the possibilities of manufacturing, in the Punjab, refined oils and vegetable fats, especially artificial *ghi*. The principal oilseeds used will be cotton, rape and sesame. The ultimate object is to replace by local manufacture the large quantities of artificial *ghi* which, I believe, are now imported from Holland. This question was referred to the Committee, and they carefully considered the most suitable equipment for the purpose. They have obtained plans and estimates for suitable plant from three different manufacturers in this country. Those estimates are now under consideration, and a report will shortly be made to the Punjab embodying the recommendations of the Committee. There is another of our new Committees in which I think you will be interested, and that is the Committee on Tanning Materials. This Committee is going to investigate two Indian materials, namely, the leaves of *anogeissus latifolia* and *carissa spinarum*, and the Director of the Forest Research Institute at Dehra Dun has been asked to furnish samples for trial. At the request of the Federation of Curriers, Light Leather Tanners and Dressers, the Committee is investigating the deterioration which has taken place, since the War, in the quality of the hides shipped from Southern India. The falling off in the quality of the hides is said to be so serious that, if it continues, English tanners will be compelled to discontinue using them. As the United Kingdom is practically the sole buyer of these hides, the loss of this market would have a very serious effect on the Madras tanneries. The deterioration in the quality of the hides is due to an alteration in the tannage. *Avaram* bark which was formerly used has risen considerably in price owing to the increased cost of collection, with the result that wattle bark has been used instead, with most unsatisfactory results. It is proposed to invite the attention of the Madras Government to the matter with a view to determining the steps which can be taken to remedy the present position, in the interests alike of the Madras and English tanners. The foregoing are some of the matters which are definitely being looked into and carefully investigated, not only by my staff but by some of these Advisory Committees. I think I have explained in my note of evidence how these Advisory Committees are formed, and I need not go into that; but I have put down in my additional note the total number of enquiries relating to India with which we have dealt in the last eighteen months; that is, since I became Director. During 1926 I find that the number of enquiries relating to India amounted in all to seventy-one; that is to say, on this side of our work, namely, on the plant and animal side. I need not bother you with the mineral side. So far this year, between January and May, the number has kept very much the same level, namely, thirty-five.

56,475. How many of these enquiries came from India, and how many came from Great Britain?—Out of the seventy-one, twenty-two were from Government officials in India, and two were from Indian officials in London. I can leave these notes with you; I brought them for that purpose, and they may be of use to you. The number of unofficial enquiries amounted to forty-seven, three of which were from India and the other forty-four from the United Kingdom.

56,476. Is the Institute prepared to act as a Post Office; that is to say, would you welcome some advertisement of your readiness to help corre-

spondents in India to get into touch with the appropriate interests or institutions in this country?—I should welcome it very much. If I may speak rather more broadly about my Institute, what I feel is this. I have only been there for eighteen months, and I feel very strongly that, great as the value is of the work which is being done and which has been done there for some time past (and I have got very good evidence of that) it can be multiplied five or tenfold if more people who require the Institute's help only knew of its existence and where to go to. In other words, and put quite shortly, what is needed in connection with the Imperial Institute is publicity of the right kind. People who have, in the end, benefited from our operations, have repeatedly said to me, "Why on earth did not I know of the Institute before; why do not you publish more about it; why do not you advertise it?" and so on. I have replied, "Give me the money, and I will advertise in the front page of 'The Daily Mail' every single day." Unfortunately, however, we only have a very small income, and we cannot do that sort of thing. Therefore my answer to your question is, "Yes, indeed, I should welcome any allusion which you can make to the Imperial Institute in that sort of way."

56,477. What is the constitution of the Institute and how is it financed?—It is financed in this way. There is an Endowment Fund which still brings in an income of about £3,500. I am giving you approximate figures.

56,478. This is not private, is it?—Not in the least. The Home Treasury give us an annual grant of £12,500. India and the Dominions between them give us, I think I am right in saying, about £10,000 a year, and our Colonies between them, another £10,000 a year.

56,479. How much does India give of that £10,000?—India gives £1,200. In connection with that, perhaps I may just say this: the figures I am giving you now are made up of two parts; one, the upkeep of the Imperial Institute less the exhibition galleries, and the other an additional gift both from the Home Treasury and all the Dominions, with the exception of South Africa and, I am sorry to say, India also, for the upkeep of the galleries. India and South Africa give us no extra annual contribution for the upkeep of the galleries. Since I was appointed to my present post, we have transformed, and are still transforming, those galleries entirely. Even if we had India's contribution, and South Africa's contribution as well as the other contributions, the total would barely cover the overhead charges of the upkeep of those galleries. At the present time I am not left with a penny piece (in fact without India and South Africa's contributions I am distinctly down) for putting in new models or new exhibits, as we are trying to do now, in order to make the place really attractive and educationally useful; in fact, to make it a sort of permanent Wembley in the way of teaching the people of this country, and especially the younger people through the schools and colleges, what each and every part of their Empire looks like, what it does and what it produces.

56,480. Have you any hopes of help from the Empire Marketing Board?—The Empire Marketing Board have helped us very finely indeed. Our Board of Governors are most grateful to them, because they gave us the money, which we wanted very badly (in fact we could not work without it) by which we were able to turn one of our galleries into a cinema hall for the purpose of showing moving pictures of each part of the Empire. The Empire Marketing Board gave us that money, and I am glad to say that the scheme has been completed in accordance with that Board's desire when they gave us the money, namely, that the project should be ready in time to be shown to the delegates to the Educational Imperial Conference next Thursday evening. Thenceforward it will be open mornings and afternoons free to the public. All our galleries, of course, are free to the public.

56,481. Your constitution is a Board of Governors, is it?—Yes, a Board of Governors, of which the High Commissioner for India is one. If he by

any chance cannot come, Mr. Lindsay, the Trade Commissioner, always represents him. Mr. Lindsay, I am glad to say, is one of our most active members on more than one of these Advisory Committees about which I have spoken. He helps me in every possible way.

56,482. Is the work you are doing being overlapped at all by the work of any other institution or group?—As far as I know, not at all. I think I can say that quite honestly and with conviction. That fear of overlapping was the *raison d'etre* of Mr. Ormsby Gore's Committee, which went into the whole matter and which made its Report in 1923. The big step which was then taken does not really affect your Commission, and that is why I have not alluded to it before. It simply brought in the Imperial Mineral Resources Bureau, in connection with which there had been definite overlapping. The Imperial Mineral Resources Bureau was born during the War in 1917, but as a result of Mr. Ormsby Gore's Committee, that body has been part and parcel of my Institute for the last two years, under the scheme of re-organisation recommended by Mr. Ormsby Gore's Committee.

56,483. There are a great many points in connection with the work of the Institute about which I would like to ask you, but we must necessarily confine ourselves to Indian agriculture?—Yes. That is why I left that point out. I have only mentioned it now because you asked me about overlapping. I can really honestly say that, as far as I know, there is no overlapping in that respect. I say it for this reason. Not only does everybody on my staff know that I am determined to avoid it, but I tell every visitor who comes to me from overseas, "Now, if, when you get back to your place you meet with some difficulty, do not hesitate to write to me in regard to it, whatever it is. I will promise you that I will not write back an official letter saying 'I have the honour to advise you that you should apply to so and so,' and then let that communication travel to you for three months, and then let another communication come back again taking another three months; I will send on your request to whoever is the proper person to deal with it." We do try to do that sort of thing, which does save an enormous amount of time. We do endeavour to send it at once to the right quarter, and our relations with those other quarters are of the most pleasant description.

56,484. *Sir James MacKenna*: Were any reasons given by the Government of India for withdrawing their contribution to the upkeep of the galleries in 1923?—I cannot tell you whether they gave any reason, but I know what the reason was, because the man who advised the Indian Government (I will not mention his name), told me himself what it was. He said that he considered the galleries at that time and for years past were dull and stupid. He said he had tried over and over again to get them improved, until at last he had said to his Government, "Withdraw the money and then let us see what will happen." That was a very practical suggestion, but the trouble is that while it was very easy to lose the Government of India, it is very difficult for me to get them back. If you gentlemen can help me in any way, I should be more than grateful.

56,485. What sum would it take to get these galleries into a respectable condition?—If I could get a grant of £3,000 from India I could make the Indian Court every bit as good as the New Zealand Court, for which New Zealand gave me £1,700, and I would do it in six months' time.

56,486. What annual maintenance would you require?—About £650 a year.

56,487. *Professor Gangulee*: Are these public galleries accessible to the trade?—They are accessible to the public, including the trade, between 10 o'clock in the morning and 5 o'clock in the evening of weekdays, and on Sundays between 2.30 and 6. I cannot do much, as I have explained to you, for the whole public generally, but what I am always trying to do is to get

a better and more widespread organisation to induce schools, which are sufficiently near to be able to afford the expense of the necessary travelling, to have their Empire geography lessons in my galleries rather than in their own schoolrooms. I am glad to say that that is working very well. To give you some slight indication of that, I may say that I opened the galleries on the 1st October last and the figures, into which I looked only three days ago, show that from that time to this the average daily attendance of schools has been four classes per diem. I do not think that is bad. That means that a good many people are getting anyhow a more intelligent idea of what their Empire is than they had before, and people of the right sort and of the right age. In the same way we try to get into touch with big federations. To give you an instance of what I mean, there is a Federation of Certificated Grocers. That is a federation which does a very excellent work in the way of training, examining and teaching people for various certificates in the different grades of the profession. These people never knew of our place at all until about six months ago, when I got into touch with them, and they are all over it now; in fact next week they are going to hold their Congress there. I can say with confidence that we are getting known to what I call the right quality of visitors. We are not bothering too much about the quantity.

56,488. The situation of the galleries is such, is it not, that people living in the centre of the city cannot always conveniently visit your Institute?—That is so, but with reference to that it may be of interest to your Commission if I stated that only the other day we settled at the Timber Committee that we should send down to a certain office in the very centre of the city, for one year our representative planks. We shall thus be able to see whether the people in the trade will be willing to go merely fifty yards and not all the way to the Institute.

56,489. On page 504, under "Intelligence Section," you refer to the marketing of Empire raw materials of plant and animal origin. The Empire Marketing Board also has the same function, has it not. You say, "This section of the Department deals with enquiries for technical and commercial information respecting the production, utilisation and marketing of Empire raw materials of plant and animal origin." I should like to get from you what is the link between your Institute and the Empire Marketing Board in this matter?—These links for avoiding overlapping are generally best if they are personal, and perhaps I can answer your question by telling you that as soon as they got busy last July, exactly a year ago, they made me, as the Director of the Imperial Institute, one of their co-opted members on what they call their Publicity Committee, under the chairmanship of Mr. Ormsby Gore. At our second meeting we found that it was necessary to divide up so as to do the Empire Marketing Board work best. We divided that again into Press and posters—that sort of thing on one side, and on the other side, education. They did me the honour of making me the Chairman of the Educational Sub-Committee, so that I am in constant personal touch, and have responsibility as a member of their Executive Committee as well as holding my position as Director of the Institute.

56,490. With regard to these investigations which you have mentioned, now that the technical departments in India are better equipped than they have been in the past, do you think that the work which you are carrying on here on behalf of India may not be better carried on in India by the Institutions there?—I think that is more than reasonable, if I may say so, and I shall not be surprised or indeed worried if and when the enquiries from India cease altogether. I do not think they are likely to cease altogether, for this reason. The people in India know better than I know where Pusa is, and where these other places are, which they have under

their own realm, but as Government officials make use of us, I imagine that before they do so they consider whether their local places can fill the bill. For one reason or another they think we may be able to help them. I say that advisedly, because it is not only India, but the Dominions as well. As they become stronger entities as industrial nations, as well as producers of raw material, and have their own research organisations and so on, they naturally will not require our help as much as they did in the past.

56,491. Are the Dominions more independent of the Institute now than they were formerly?—They are more independent of us now than they were before, but we have done some very important work, particularly for New Zealand, during the last twelve months.

56,492. It seems to me you must take into consideration two factors, first, that there are commercial representatives of the Dominions and of India now living in London, and secondly, with regard to the technical side, countries like Canada, New Zealand and India have greatly strengthened their technical departments. When those two factors are in full working order, I should like to get from you your opinion as to what will be the position of the Imperial Institute?—The Imperial Institute will still have more work to do than it can comfortably manage, and for the very good reason that as the need for our help in India and in the Dominions diminishes, so the need for our help will increase monthly and yearly, in our tropical Empire. Those Colonies are giving us more and more work to do. That was made very clear to me the other day at the Colonial Governors' Conference. I am glad to be able to state that each and every one spoke with conviction of the real practical help which our Reports were giving them. That is the answer, I think, to your question.

56,493. With regard to the Colonial Scientific and Research service, the proposed relation of your Institute with that service is that the offices of the Council would be situated in the Institute. Is that all?—That is all. That will not come about, great as it is, probably for another fifteen months. They have a lot to do between now and then. It has to be referred to each of the Governments and so forth, but if and when it does exist, it is clear that, as they set a great importance on their task as a clearing house, it would be ridiculous to have two clearing houses, especially under one roof, and you will find it will make use of our intelligence staff, with such additions as may be found necessary.

56,494. Do I understand that these investigations into Indian silk, Indian timber and vegetable fibres are proceeding now, or are they finished? Is the work continuous?—Yes, it is continuous.

56,495. *Mr. Kamat*: Out of these seventy-one enquiries which you told us you received in 1926 from India, how many have materialised into something tangible?—I could not say offhand. No one expects to see fruits emerging as the result of our enquiries within a few months. I have made a few notes here as to the nature of these enquiries, and I shall be pleased to hand them in.

56,496. With regard to the question of overlapping between your Institute and some of the technical advisers in India, I should like to know what would happen in one eventuality. Supposing a non-official enquirer, say a private firm in India, sought advice from Dehra Dun regarding a particular forest product or a particular timber, and he received certain advice which he considered as not satisfactory. Supposing he appealed to you further to investigate the industrial possibilities of the product, and that your Institute gave advice contrary to the advice of Dehra Dun. What would happen? Would the Government take your report as the final authoritative one?—(*Sir David Prain*): May I answer that? There would be no difficulty of that sort at all. There are two bodies in this country—the

Forest Products Research Board, which is engaged in that kind of work on the scientific side, and there is also the department of the Imperial Institute which does that kind of work. Those two bodies are in the closest possible touch. The closest liaison has been established between the Forests Products Research Board and the Imperial Institute regarding everything which relates to timber or to forest products of any kind. The Department of Scientific and Industrial Research, in connection with its Forest Products Research Board, is in the closest touch with Dehra Dun. It knows exactly what is being done at Dehra Dun. I dare say you are aware that everything that is done at Dehra Dun is done by agreement, in the same way as all the work carried out in South Africa, Australia and Canada is. The whole of the work is done according to standards which have been set, by accident as it so happens, by the United States, who had the sense to begin first to investigate forest products at Madison, Wisconsin. All our places in the Empire follow the methods which have been adopted at Madison, Wisconsin, and they know exactly what is being done in every place about every forest product and every class of timber.

56,497. Do you mean to say there is no possibility of any honest conflict of opinion between Dehra Dun and your Institute?—I dare say there would be conflict of opinion, but it would be put to the test. It would not be merely a statement of opinion, it would be a statement of fact as to what happened with a particular product; what it contained, what happened with a particular timber, what tests it withstood; what uses it had, and all the rest of it. The whole matter is thoroughly organised.

56,498. *Sir Henry Lawrence*: Is your Bulletin very widely distributed in India?—(*Sir William Furse*): Not as widely as I should like. I speak from correspondence which I have lately had with Dr. Clouston. I am sorry that I have not yet met Dr. Clouston personally, but I have had very friendly correspondence with him during the last few months, and I gather from him that he is disturbed at the amount of weight which agriculturists in India give to American publications, and how little they know of our publication.

56,499. Is your Bulletin distributed only to subscribers?—The biggest bulk of the distribution is by exchange with the bulletins or periodicals of other institutes all over our Empire, and indeed all over the world. In that way we distribute something like 1,100 copies of each number of the Bulletin. The number which we sell to subscribers is, I am sorry to say, exceedingly small. I do not think it amounts to 200.

56,500. I should like to see your Bulletin very widely distributed to every kind of official.—A great number go to India. They go to all the different Provinces as well as to Government headquarters, and to the different institutes which I have mentioned, like Pusa and Dehra Dun.

56,501. When I was Director of Agriculture in Bombay I used to obtain your Bulletin by subscribing for it, but my successors found they could not afford to do so, and cut it off. It was very unfortunate, I think?—Speaking merely from the financial point of view, it is a very serious matter to me in making up my budget and my accounts. I want to spread the Bulletin as much as possible, but it is very difficult to get subscribers who will put down the 15s a year which is necessary. It is extraordinarily difficult to get it to the right people. We have lately published a small excerpt of it dealing with silk in Cyprus, which I thought might show people the kind of work which is going on.

56,502. I quite agree it is a very valuable Bulletin, and you ought to get the Provincial Governments of India to give you a contribution towards it?—May I address the Chairman and say that if the Commission can help

us in that way in its Report we shall be very grateful. It is only through these Commissions and so on that one does get the kind of help which is necessary from outside.

56,503. You have a very useful Library in your building, have you not?—Yes.

56,504. Is that open to the public on special application or by ticket?—I have had notices put up outside the building to the effect that the Library is free to the public, but as a matter of fact anyone who really wants to use it either goes direct to the Librarian or to me, or to one of my principal officers and states the sort of subject he wants to refer to. Then we get him on to the people who know all about it, and give him every assistance.

56,505. Shall we be able to visit your Institute if we wish to?—Most certainly.

56,506-7. Would you deal with a problem such as the following? We are often troubled with plagues of rats in India, and many years ago I applied to the Natural History Museum for some information as to whether the skins of rats could be used in trade here. After some enquiry, they told me that they saw no probability of the skins being used, and very confidentially added that there was a very severe competition and opposition from the vested interests in the trade. Has the problem of the utilisation of the skins of rats ever been put before you? —(*Sir David Prain.*) When an enquiry concerning a rat-poison came, the principal officer consulted me and I said that perhaps the appropriate department in the Ministry of Agriculture and Fisheries might be able to help us. I knew that they had a Rat Department at the Ministry, but on enquiry we found that that Rat Department had been suppressed, and there was no further information to be got from them. We learned, however, that there was somebody at the University of Leeds who was dealing with the question of rat poisons, and the matter is with them at the moment, they are investigating that particular point. If an enquiry of that sort came to the Imperial Institute, although the Imperial Institute does not deal with rats, it would take any amount of trouble to find out the proper place to which to forward the enquiry. There would thus be a great saving of time and an absence of circumlocution.

(*Sir William Furse.*) That was the sort of thing I had in mind when I mentioned just now about promising, on receipt of any enquiry, to send it forward to the proper place if we did not ourselves deal with it.

56,508. The question of poisoning rats is being investigated, is it?—(*Sir David Prain.*) We do not know yet.

56,509. From our point of view the plague of field rats would be best dealt with if it could be made an advantageous operation for men to trap these rats and receive some small payment for the skins?—(*Sir William Furse.*) There is an analogy between your case of rats and the rabbits in the Antipodes. We have a very interesting show-case in the New Zealand Court showing how that pest, and it was nothing but a pest for years, has new been turned into a very fine industry. We show how men's hats are made out of rabbit skins and how our wives' sables are also made out of rabbit skins. Rabbit skins are coming over in their millions now from the Antipodes, and it is a very big industry. I do not know whether the same thing could be done with rats.

56,510. At any rate you would not regard it within your purview to assist in the matter?—No, but we would not leave any stone unturned to try to get it taken up by the proper people.

Lieut.-General Sir William Furse and Lieut.-Colonel Sir David Prain.

56,511. I gathered from your remarks that the Indian Gallery had not been improved because the annual grant had been discontinued?—It was taken away from us in 1923.

56,512. Was not the Institute largely built with grants obtained from India?—Yes, undoubtedly.

56,513. Do you consider that India has a claim on the Endowment Fund and on any other revenues which may be appropriated for the upkeep of the Institute, somewhat in excess of other parts of the Empire from which the initial grants for the building of the Institute did not come?—To some extent, but I do not think you can really take that very far. Unfortunately in years gone by, at the start, the place got into trouble financially, with the result that the Government took over the debts, which amounted to a large sum. It took over the building with the debts, and took half of it away from us and give it to the University of London. I am glad to say that now it is only a matter of time before we get it back again. We shall do so when the new buildings are ready for the University of London, which will be in six or seven years' time. But I do not think you can carry your argument very far. I am doing what I can.

56,514. *Sir Thomas Middleton*: Sir Henry Lawrence asked if your Bulletin was widely distributed. I think you replied that you doubted whether it was widely distributed. I want to follow that point. You explained that you had a large exchange list of about 1,100 copies, but that the sales amounted only to about 200 copies. Have you any free list so that you may place the bulletins where they are likely to be well used? Dr. Clouston referred to the importance attached to American bulletins in India and how one applied to Washington for information. Washington has a large free list and places its bulletins where they are likely to be skilfully employed. Have you any similar system?—I am afraid none at all. The difference between Washington and London is a matter of the Exchequer. As long as America has all its riches it can do very much more than we can.

56,515. Do you consider it wise to collect all the information you do and not to see that it gets into the right hands by means of a liberal distribution of your Bulletin to the right people? Do not you agree that your free list might well be made much larger?—Certainly, if somebody will find the money.

56,516. You want funds which will enable you to do it?—That is what I mean.

56,517. You have explained how you maintain touch with the Empire Marketing Board. I think you are in close touch with the scientific departments, such as the Department of Scientific and Industrial Research, and other similar departments. Will you explain what your general method is of keeping in touch with them?—There again it is a personal touch. The head of the Department of Scientific and Industrial Research is a member of our Board of Governors, just as the High Commissioner for India is. To avoid any possibility of overlapping it was definitely laid down in the Report of the Ormsby Gore Committee that that official should be the Chairman of a small Laboratory Committee which should be part of my organisation, and I have made use of him in that sort of way with regard, for instance, to the matter of extra machinery and so on which may be required in our laboratories. We are constantly in touch with each other on such matters.

56,518. You have two methods of getting information out to the public, as I understand, the printed Bulletin and direct correspondence. Which is the most fruitful in your experience?—It is very hard to say. One leads

to the other. The Bulletin serves the purpose of letting people know what we are doing. Somebody reads it or hears of it, alights on some particular thing and says, "These people are the people I ought to write to about so-and-so," then they follow it up with a visit or an enquiry.

56,519. Has the correspondence grown in the last few years?—Slightly; there has not been very much difference.

56,520. Do you anticipate a considerable increase in correspondence?—No, I do not think so. I should welcome it, but I do not anticipate any early increase.

56,521. When you were approached by the Punjab Government for aid in setting up oil machinery, did they put to you any question relating to the oilseeds which they proposed to use?—Yes. I think I mentioned just now that the oils were to come from cotton seed, sesame and rape seed.

56,522. When you are answering a question like that dealing with oil machinery, do you confine yourself to the question raised, or does your Committee take up the subject as a whole? Do you ask yourselves: "They propose to use rape seed oil for vegetable *ghi*. To what extent is this oil desirable in vegetable *ghi*"?—May I ask Sir David Prain to reply to that? He is the Chairman of the Council and knows the matter intimately. (*Sir David Prain.*) The Committee did go into the matter very carefully and were very critical indeed of the suggestion.

56,523. My object is to find whether your Committee, thinking that the Punjab Government might not have all the information which they should have, volunteered information and criticism, or whether they merely replied on the particular point respecting machinery which was put to them?—I think they went into the whole subject and made a report on the whole subject. (*Sir William Furse.*) You have a list of the actual members of that particular Committee. You can see the sort of people with whom we consult.* I think that any of you gentlemen who attended one of the meetings of these Committees would be astonished, as I am every time, at the wonderful way in which these gentlemen, who are really the highest authorities in these matters, give their time and their full interest and knowledge voluntarily to the work. I attend all these meetings for my own education, and in order to see how the work is carried out, and I am astonished at the work which goes on there. The Reports of the Committees must be exceedingly valuable.

56,524. *Mr. Noyce*: Does the Imperial Institute levy any fee for any work done?—Only from private individuals; never from Governments. We always tell the private individual when the enquiry comes in what it will cost him. It is something very small. We naturally do not charge any fee to Governments, because we get their subscriptions, and we are their servants.

56,525. So that if a private individual in India goes to a Government department and gets that Government department to make the enquiries for him, he escapes any fee?—That is so.

56,526. *Professor Gangulee*: Is India entitled to a certain number of copies of your Bulletin in view of the subscription which they pay?—I can let you know how many we actually send to India if you would like that information.

56,527. The number of bulletins which is sent does not depend on the amount of subscription which India pays?—Not in the least.

56,528. Is not the cost of the bulletin rather prohibitive to private persons? Is there no way of reducing the cost of printing and publishing?

* See Appendix.

—We went into that most carefully during the last year. So far from reducing the price, at one time we had to raise it, but we have brought it down since, I am glad to say, to the original price of 3s. 6d., but we have only done so by reducing its bulk in a way which we thought would not diminish its quality or value. I do not think you can get it any cheaper.

56,529. I notice that it is printed on very good quality paper. I was wondering whether you could reduce the cost in any way?—All that was gone into by our Publications Committee.

56,530. *Sir Henry Lawrence*: Could we have a copy of your distribution list for India?—Certainly.

56,531. *The Chairman*: Sir David Prain, would you like to make any observations on the general questions which we have discussed so far?—(*Sir David Prain*): No, I have nothing to say.

56,532. I will confine myself to your memorandum on the production of quinine on page 508. Would you like to add any statement to that memorandum at this stage?—Only this, that I have to apologise for its shortness. As a matter of fact, three years ago a body in this City asked me to deliver a lecture. I chose this subject as it was then interesting to Government and the League of Nations. I spoke for an hour without having notes, which perhaps was unwise, but the body seemed to have good reporters and made a good newspaper report, and I thought I would let it go at that. I think the easiest way would be for you, Sir, or for any members of your Commission to put to me any questions on any points which they think are obscure, because my remarks are condensed. I will try to explain any point as briefly as I can.

56,533. I greatly admired your note, which covers the ground very fully. The position as it exists to-day is already before the Commission, but there are one or two points which I should like to ask you. Do you, at this stage, favour the suggestion that the cinchona tree should be grown as an enterprise by the Central Government on a large scale?—My mind is perfectly open. There is one thing the Government of India must remember. Chemistry has been endeavouring for forty years at least to make synthetic quinine, and it may make synthetic quinine any day; and when it makes synthetic quinine then it will not be worth the while of the Government of India to grow cinchona, and it will not be worth the while of the Government of India to separate quinine; but if public opinion insist that it must be grown, then I think the Government of India, like the Governments of all our other Colonies, will have to do something until synthetic quinine, or some substitute for quinine which is equally good, comes along. I am sure that Professor Gangulee knows, although I do not know, whether any of the other members of the Commission are likely to know, that in Germany not synthetic quinine but a synthetic substance as a substitute for quinine is said to have been found which is as good as quinine in dealing with malaria. We do not know at what price it can be put on the market, but the moment it is put on the market at a cheaper rate than that at which you can purchase quinine, then there will not be the same necessity for growing cinchona. On the other hand, as you know, Sir, one great difficulty which one had all the time that one was in the service of the Government of India was that the Government of India's financial officers, just the same as the Home Government's financial officers, said that we should not separate quinine in India, or grow cinchona bark, because one could purchase quinine separated from cinchona bark grown elsewhere at as cheap a rate as that at which it could be separated by the Government of India itself. One had naturally to point out that there might be a danger if that attitude were carried into action, because the time

might come when we should be at war and when we should not have control of the seas and when we should not be able to get either supplies of bark or quinine for our soldiers. That plea, which I ventured to put forward in 1903, was accepted by the Government of India, and in deference to that opinion, it was said: "Let cinchona still be cultivated and quinine be separated by us." There is another point in connection with that. One reason why the price of quinine became so low as it did was that the traders of quinine in Europe were anxious to get once more the trade of the Government of India in quinine; and if they could reduce the price to a figure which was lower than that at which it was possible for the Government of India to separate quinine from its own cinchona bark, then at the moment at which the Government of India ceased to grow cinchona and ceased to separate its own quinine, up would go the price against India. That was not considered a very serious argument by the Government of India, but the other one which was put forward at the same time, with regard to political and perhaps other possibilities in war time, was listened to, and it was said: "Let us go on."

56,534. Setting aside the possibility of a synthetic substitute being devised and placed upon the market, would you advise at this stage, having regard to all the circumstances, that Governments in India should take active steps to grow the plant?—I think so. I think the Government of India have acted very wisely indeed in sending my successor all over India to look for places where it might be possible to extend the cultivation. I cannot speak of my own knowledge at all, but I understand that an area has been found in Burma where they are doing it. I understand also that the prospects there are good. I think that is a thing which certainly should be continued until such time as it becomes unnecessary. Besides, it does not matter if, in the end, cinchona is no longer grown by the Government of India. I had the figures during the twenty years I was associated with the cultivation of cinchona, and I know that, from the time that these cinchona plantations were started in Bengal until the time I left, they had repaid themselves eleven times over.

56,535. Do I understand that you are not familiar with what has transpired since you left India?—No, I am quite unfamiliar with that.

56,536. On page 510 of your note, you say that no monopoly in cinchona is enjoyed by Java; in fact, the monopoly is a quinine monopoly?—That is so; I have tried to explain it.

56,537. I want to be sure that I understand that. Is that because the price which the public is prepared to pay for quinine is not sufficient to finance the growing of the tree and the preparation of the drug in other parts of the world?—It means this, that there is not one cinchona tree: there are at least three cinchona trees. I leave out of consideration a fourth one; there is a fourth, which we do not think of in India at all. The three are the red bark, the crown bark and the yellow bark. In the case of all three you may get the same amount of alkaloids; suppose you get six per cent., they are equally rich in alkaloids; but only one-third of the six per cent., that is two per cent., will be quinine in the case of red bark; in the case of crown bark four and a-half per cent. will be quinine, and in the case of yellow bark there will be still more quinine.

56,538. So that the product which pays exists in larger quantities in the case of the yellow than in the case of the other two varieties?—That is so. It costs just as much to clear a piece of forest, raise the seedlings,

put them into the ground, cultivate the tree, and harvest the bark in the one case as in the others; but the bark is paid for, not on the basis of so much weight of bark, but on the basis of the quinine unit. In Java they have the volcanic soil and the humid conditions which are exactly the conditions in the Andes where the plant is wild. In the South of India they have the same climate, but they have not got the volcanic soil. The same applies to Ceylon. The planter in Java finds he can grow yellow bark, but the planter in the South of India finds that he cannot, and he finds he is only going to get 4½*d.* for every 6*d.* that the man in Java gets for the same amount of bark produced on the same area with the same amount of labour; therefore, when the people who are separating quinine reduce the price to a level when it no longer pays the man who is getting 4½*d.*, the man who is getting 6*d.* can go on. That is the extent to which there is a monopoly; that is the only monopoly there is; it is not a monopoly of quinine but a monopoly of the yellow cinchona, which is the kind that has that high percentage.

56,539. What capacity for expansion has Java?—That I do not know; they can go to Sumatra where they have the same kind of soil. At present I expect they are not growing much cinchona in Sumatra because rubber and tobacco and other things are paying them better. I might explain that the difficulty, as I understand it, and the thing that has led to this outcry that the Empire is not producing sufficient quantity of quinine is this: I have said that the Java planter says he does not get enough for his bark; I am quite sure he does not get as much as he used to. At the end of the War an arrangement had been come to between the separators of quinine and the planters. The arrangement was this, that if in a year the separators of quinine bought from the planters in Java, as much cinchona bark as would yield them, say, 1,000,000 kilos. of quinine, then the separators in Europe undertook to purchase in the next year as much bark from the Java planters as would give them the amount of quinine they had separated the year before. In Russia and the Balkan States, in the catchment areas of the Volga and the Danube, during the War there appeared a kind of malaria more severe than the malaria they had previously been accustomed to in that area. The Soviet Government went to the European separators of quinine and said: "Here is money, here is gold; we give you this gold in order that you may give us quinine; we are dying and we want quinine." When asked: "How much quinine do you want?" they replied: "A million kilos." Then the separators of quinine said to themselves: "But if we give Russia another million kilos., that will be 2,000,000 we shall be issuing this year, and the planters in Java will say to us next year: "You gave out 2,000,000 last year; you must buy enough bark to separate 2,000,000 this year; rather than have to face the risk of having an extra million kilos. of quinine in stock next year, we will tell Russia we have not the quinine"; and they did not supply the quinine. That, as I interpret the situation, was the beginning of the outcry that the British Empire was not producing sufficient quinine.

56,540. In what year did that occur?—The complaint arose two or three years ago.

56,541. After the War?—Yes. The difficulty is this, that except in the Eastern Himalayas where we can grow the yellow bark, the same bark as is grown in Java, there is no place in our Empire that I know of where you can grow it. And even in the Eastern Himalayas, where we can grow the same kind of cinchona, there is the fact that we have got five months of dry weather. Professor Gangulee will know what that

means. That puts us behind in our output as compared with Java. There are some few trees that are extraordinarily rich in quinine; in Java, they do not harvest those trees, but raise seedlings on to which they graft twigs from the very rich trees; their *malis* are so skilful that they can graft in the open and 97 per cent. of the grafts will hold. Now, as Professor Gangulee will tell you, our *malis* in Bengal are just as clever as the *malis* in Java; but if we want to do grafting in the Himalayas, we have got to graft in frames, we have got to plaint out the grafted plants; and, although we can get just as good a percentage of grafts to hold in frames, when they have got to face the five months of dry weather a large percentage of these grafts fail in the field. Therefore you have two handlings, because you have to graft in the frames instead of in the fields, and then you have the percentage of loss which we cannot avoid with mangoes, cinchona or anything else that we graft in Bengal. The result is that what is a profitable thing in Java ceases to be a profitable thing in Bengal. Then there was another matter which you will not find referred to in the reports. In 1879 the Government of India decided that it was not necessary any longer to have a Government Quininologist. During the years that they had a Government Quininologist they had a very able man who enabled them to separate the total alkaloids from the red bark, which was quite a good thing to do; he also established the relationship between the morphological features of various cinchona trees and their alkaloid content. When that had been done, the Government of India said: "We do not need to know any more; we do not want a Government Quininologist any longer." But since those days, as Professor Gangulee will tell you, we have learned a good deal about genetics, and when we made a systematic survey of our barks, we found that our barks which had an average yield of six or seven per cent. in the year 1879, by the year 1899 had gone down to between three and four per cent., so that these morphological features were no longer related to the quinine content. When this was pointed out to the Government of India, Government listened to the representations and re-appointed the Quininologist. Colonel Gage will be able to tell you what they have got the percentage up to; I believe the percentage is now up to what it was in about 1879 or 1880.

56,542. I understand from your note that you do not yourself feel satisfied that the curative virtues of quinine itself have been not exaggerated at the expense of the other contents of the bark?—Of course, you must remember that I am in a difficulty there, because I am a member of the Indian Medical Service, and I cannot cast that away from me. When you are a servant of the Government of India, and in a particular Service, you do not criticise your senior officers, because if you did they might say you were pestilent and would not listen to you; and you do not dare to say anything to junior officers, because they have come more recently from a medical school and know everything. But you can speak to those who are your colleagues and contemporaries in the Service. I used to ask them how much quinine they gave their patients. Their view was that if a patient was suffering from malaria it did not matter if they gave the patient a little too much quinine. I pointed out to them that although that might be so from their point of view when prescribing for the patient, it was unsatisfactory from my point of view because I was responsible to the Government of India for the supply of quinine, and every extra grain they gave, unnecessarily, to any patient meant that some other suffering person was deprived of that relief. Nor could I ever get them to tell me whether quinine was really any better than the other alkaloids. The bark

preparations are made from red bark, which, as I have already explained to you, has only one-third of the alkaloid quinine content; the other alkaloid contents may be just as useful as quinine itself. The fact that the medical profession will insist on always prescribing quinine, and quinine alone, makes it essential that a man who is growing bark should grow the bark that is richest in quinine, and makes it necessary for the separator to purchase the bark that has most quinine in it. The other barks can be grown in East Africa, West Africa, Malay Peninsular, on the West side of India along the Ghats. I may say now that the Medical Research Council has recently been very actively engaged in investigating the relative merits of the various alkaloids of quinine, and I dare say, as time goes on, they will be able to make reports that will perhaps strengthen the hands of the Government of India in connection with the growing of the barks other than the yellow bark. It is an extraordinarily complex subject; very little attempt has really been made to understand either the hygienic relationships, the economic relationships, or, indeed, any of the relationships of these alkaloids.

56,543. *Sir Henry Lawrence*: Do I understand correctly that the bark that has been grown in all the plantations in India is the same whether in Darjeeling, Burma or Madras; it is all the yellow bark?—No, in the South of India they could only grow, profitably, the crown bark. There is a small area where they can grow yellow; but in Travancore all the planters who at one time grew cinchona grew crown bark.

56,544. That is grey?—No, crown bark, i.e., the original Peruvian bark.

56,545. New plantations are being made also?—I cannot tell you what they are planting; there is the possibility that they are planting largely a hybrid. We had hybrids which are fairly useful; the object being to get a cross between a strong growing kind, a kind that would certainly thrive, like *succirubra*, red bark, with the high quinine content of yellow bark, *calisaya*.

56,546. The amount now being grown by Government in India is about 4,000 acres?—I cannot say. Does that include the new Burma plantation?

56,547. I understand so?—We had nothing like that between us, in Madras, and the Eastern Himalayas when I was there.

56,548. You recommend that the whole of the amount of quinine that is required in India should be grown in India?—I think it would be wise if it were possible; I think it would be a good thing to be able to make that an ambition and get to that point.

56,549. But you do not anticipate that that would be possible?—It all depends on whether you can get enough ground suitable; there may be more land in Burma; but I understand there is very little in the South of India that you could bring into cultivation of cinchona.

56,550. *Mr. Noyce*: In Madras they are opening up a big new plantation?—I am glad to hear it.

56,551. *Sir Henry Lawrence*: Does the cultivation require much skill?—A good deal in the earlier part; it requires a great deal of skill and care, especially in the raising of the seedlings.

56,552. Is that skill in supervision or skill in the actual handling?—Skill in the actual handling; only women and children can do it properly. We used women and children for pricking out the small seedlings; men were too clumsy.

56,553. Then the Government of India will require a very carefully trained staff?—You can always get a good supply of quite careful native gardeners in India quite easily; we had no difficulty at all about that.

56,554. It has been suggested that the plantations in Burma are not very popular with emigrant coolies: that people from India are not prepared to go there to work?—That may be; we heard the same thing about Malaya; service there was not very popular; the rice was different for one thing, and that might be enough.

Sir James Mackenna: The difficulty in Burma is due to the competition of rubber and timber against the cinchona plantations in regard to labour.

56,555. *Sir Thomas Middleton*: You mentioned that yellow bark succeeded in Java because the soil was volcanic and similar to the soil of Bolivia?—Yes, they were careful to grow it in volcanic soil. I have not been there myself, but Sir George King, who was my chief, described to me the kind of soil: you could put a walking stick down into it to the very top quite easily; it was that sort of soil.

56,556. The soil of the Anamalais, derived from gneiss, is probably acid as compared with the volcanic soils of Java; do you know whether any attempt has been made by adding lime, or lime and potash, to convert the soil into a suitable one for yellow bark?—I do not know whether they have done that in Madras; we did not need to do that in the East Himalayas.

56,557. You do not know that any attempt has been made to modify the soil to suit the trees?—No; but the difficulty is this: although this is only prophesy, it is prophesy which is certain to be right: they will be able to grow cinchona there as well as in the Nilgiris; that is to say, it will be crown bark; crown bark grows perfectly well.

56,558. I understood the percentage of quinine from crown bark was much less than from yellow bark?—That is the difficulty; it is not the question of the soil so much, but that the yellow bark will not grow in that soil.

56,559. If you can so treat the soil as to grow yellow bark, you get over the difficulty?—Yes, that would be an excellent suggestion to make to those in charge of plantations.

56,560. *Sir Henry Lawrence*: Is this yellow bark the one known as quinine Ledgeriana?—Yes, that is the kind we like to grow.

56,561. *Professor Gangulee*: That is a hybrid, is it not?—No, the yellow is not a hybrid; it is the one native in Bolivia; it is furthest South in the Andes; it is of the same richness in alkaloids as the other kind, but it has made up its mind that it favours the alkaloid which is quinine.

56,562. *Mr. Noyce*: I am not sure what you mean when you say quinine still remains the only cinchona alkaloid that is officinal. That means that it is the only alkaloid admitted to the pharmacopœia. Is that the reason for the botanical name: officinalis?—Medicine is so illogical that the bark that is officinal is the one which is not rich in quinine. I hoped you would not notice that.

56,563. I did notice it and I wanted you to explain that. Were they making much cinchona febrifuge in your time?—Yes, quite a good deal; the people who were wise used it in preference to quinine; medical missionaries used it. When we found that there was a much increased demand for quinine, which we had to separate from our yellow bark, we had to go to the South of India and purchase a quantity of crown bark. The result of the crown bark was that, as Sir Thomas pointed out, we got only 4½ parts of quinine. I was at the trouble to separate cinchonidine, which is the next most plentiful alkaloid in crown bark, from the residue, but the Medical Department of the Government of India said it was not to be

used; therefore it was no use going on separating it. What we did then was to use the residue, after we had got the quinine out of the crown bark, like the alkaloids of the red bark; cinchona febrifuge became in that way not only the alkaloids of red bark, but all the alkaloids of crown bark after the quinine had been taken out. That was noticed by the medical missionaries, on whom we relied for a large quantity of our demand; they found that the crown bark febrifuge was a better medicine than the old red bark febrifuge. I therefore suggested the missionaries trying for their dispensaries simply the waste residue from crown bark; that is to say, all the alkaloids after both the quinine and the cinchonidine had been taken away, without bothering about red bark febrifuge at all, because they can have that waste residue at a lower price, especially if we did not purify it. They told me they did not want it purified, because their patients preferred medicine with a nasty taste and a brown colour. They found again that this was more effective as a medicine than the crown bark cinchona febrifuge was. The difference between those, if you work through them, is not that you have got less and less quinine in each, but that you have a greater and greater percentage not of the crystallised alkaloids but of the amorphous alkaloids which will not crystallise. The amorphous may have something of the relation to the other alkaloids that molasses have to sugar. These alkaloids that will not turn into crystals are absorbed more readily by the system of the patient, and perhaps affect the malaria parasite more readily. Reliable medical missionaries went into this question clinically on my behalf very carefully, and the conclusion to which one was driven was that the greater the percentage of the amorphous alkaloid in the substance you gave your patient, the more effective it was.

56,564. There is a very large demand for cinchona febrifuge nowadays; I think the new Madras plantations have been designed to meet it?—I am glad to hear that. You will all know the name of the firm of Kemp & Company in Bombay. The senior partner of that firm once paid a visit to Calcutta, and he came down to the Calcutta gardens and talked to Sir George King and myself about many things in which he was interested. After Sir George and I had given him all the information we could, Sir George said: "Now you have asked us a lot of questions; do you mind my asking you one? Is it a fair question to ask why it is that you take 100 lbs. of cinchona febrifuge every month in the year from us?" The reply was: "It is a perfectly fair question. You do not see the 'Times of India': but if you did you would see every morning that we have an advertisement there of Kemp's Famous Fever Remedy. That is a solution of your cinchona febrifuge, and I submit it is the best remedy for fever that is offered by anybody in India." Professor Gangulee will be able to tell you that there was an able countryman of his who had a chemist's business in Calcutta: he purchased from us not quite as much but still a large quantity, and he made a similar preparation. I forget his name, but I know the preparation made him rich; so rich that when there was a marriage in his household a theatre was taken by him for three nights in order that all his friends and the friends of the bride and bridegroom should be entertained.

56,565. *Professor Gangulee*: Your advice to the Government of India is that they should go on with the cultivation of cinchona; has there been sufficient experimental work to indicate, first, the climatic, and secondly the edaphic factors associated with the cultivation of cinchona?—Yes, I think we have done sufficient. For instance, we find that the rainfall must not be too small and not too high; we found that if we had more than twenty inches it was not good for cinchona.

56,566. Has there been a general survey taking into consideration all the edaphic factors?—I cannot tell you that, but I think perhaps Colonel

Gage may be able to say what has been done during the twenty years he was in charge.

56,567. Such research must precede the further extension of cinchona cultivation in India; if you want to use the new areas, one must know what conditions are necessary. On this question of plant genetics applied to cinchona cultivation, do you think adequate research has been conducted by the Government of India to obtain the number of suitable strains?—They thought they had in 1879, and they found they were wrong; but I think we have been doing that steadily ever since we detected that the average alkaloid percentage had diminished. In 1905, the Government Quininologist asked for was appointed; that has I believe been one of his duties all through.

56,568. Are you familiar with his work now? Is he going on with this plant genetic question?—I imagine so; but I do not know whether he is still in Bengal or whether he has gone now to Madras.

56,569. *Mr. Calvert*: Would you kindly make clearer a sentence at the bottom of page 509: you say: "The relative proportions of these alkaloids in particular kinds of cinchona remain unaffected by the variation in their percentages"?—That means this: you may have a strain that has only three per cent. of alkaloids altogether, and you may have another strain which has six per cent. of alkaloids, you may have another that has nine. I have known instances of individual trees that went as far as twenty per cent. of alkaloids. There is that variation in the total alkaloid content. But you will never get more than one-third of the alkaloids quinine in any red bark; no matter how rich it is, no more than one-third will be quinine; in crown bark no more than three-quarters will be quinine; in yellow you will always expect to find about five-sixths at least to be quinine.

(*The witnesses withdrew.*)

APPENDIX.

Advisory Council on Oils and Oilseeds.

Dr. A. W. Hill, C.M.G., F.R.S. (Chairman).
John Allan, Messrs. Joseph Crosfield & Sons, Ltd.
Roland J. Bayley, O.B.E., Messrs. Goodlake and Nutter, nominated by the London Oil and Tallow Trades Association.
W. B. Bibby, Messrs. J. Bibby & Sons, Ltd., nominated by the Seed Oil and Cake Trade Association, Liverpool.
E. R. Bolton, F.I.C.
A. Braae, Erith Oil Works, Ltd., nominated by the London Oil and Tallow Trades Association.
A. Chaston Chapman, F.R.S.
Alex. A. Cowan, The African and Eastern Trade Corporation, Ltd.
W. H. Fenwick, nominated by the Incorporated Oil Seed Association.
W. S. Ferguson, nominated by the High Commissioner for New Zealand.
J. E. Frost, The British Oil and Cake Mills, Ltd., nominated by the London Oil and Tallow Trades Association and the Incorporated Oil Seed Association.
Robert L. Holt, Messrs. John Holt & Co., Ltd., nominated by the Liverpool United General Produce Association.
William C. Job, Messrs. Job, Ivory & Co., Ltd., nominated by the High Commissioner for Newfoundland.
H. A. F. Lindsay, C.I.E., C.B.E., nominated by the High Commissioner for India.
H. A. Treganowan, nominated by the Department of Overseas Trade.
G. T. Bray, A.I.C., Imperial Institute (Secretary).

Lieut. General Sir William Furse and Lieut.-Colonel Sir David Prain.

Mr. W. A. WILSON,

Agricultural Products Representative of the Federal Government of Canada.

Note on Agricultural Legislation, Administration and Research in Canada.

1. As far as Canada is concerned, the centre of authority is at the Capital, but each Province is substantially independent.

2. The control of contagious diseases amongst live stock is a matter for the Federal authorities entirely, whether the disease occurs in any one Province or is general throughout the Dominion.

All quarantine measures in regard to live stock are under Federal control.

3. As to Finance, Finance follows authority; when authority is central so is Finance; when it is provincial, Finance is also on a provincial basis.

4. With regard to research, the Federal Department of Agriculture carries on a considerable amount of research work in connection with the experimental farms which come under its jurisdiction, and which are scattered throughout the Dominion. In addition to this, the Federal Department maintains Laboratories in connection with Plant Pathology, Entomology, Animal Pathology, Seed Testing and Dairy research at a number of points, at all of which research problems in connection with particular phases of agriculture are carried on.

The Provinces also have the right, and do carry on research work along agricultural lines, particularly at the various Agricultural Colleges connected with the Universities. This research work is frequently carried on in co-operation with Federal Institutions operated by the Federal Department of Agriculture, but is also in some cases carried on independently.

In addition to this, there exists in Canada a body known as the Research Council of Canada, which functions in a general, although rather desultory, advisory capacity in connection with research work, not only in agriculture but in other fields as well. The Research Council co-operates by the furnishing of funds to various institutions, both Federal and Provincial, and in some cases to individuals for the purpose of assisting in carrying on some particular line of research. The Council, however, does not operate any research Institutions of its own.

Education is purely a matter coming under Provincial jurisdiction. Each Province has its own Department of Education, which administers educational matters in its own boundaries. The Federal Government has no control over education, this being one matter set aside by the British North America Act as coming under the jurisdiction of the Province.

Extract from Report of the Committee of the Privy Council for Scientific and Industrial Research for the Year 1924-25.

Canada.

The report of the Honorary Advisory Council for Scientific and Industrial Research of Canada for the year ending March 31st 1924, has been received. During the year, Dr. Frank D. Adams, who had rendered conspicuous service as Administrative Chairman for nearly two years, retired from that position, and Dr. H. M. Tory, President of the University of Alberta, was appointed to fill the vacancy. Special reference is made to the extent to which the activities of the Research Council are carried on by its members who, without receiving any remuneration for their services, give generously of their time and experience in furthering the work of this Council because they are convinced that the programme of the Council affords them an

opportunity to make a very definite contribution towards industrial and national progress in Canada. The Research Council has continued to co-operate in every possible way with the various departments of the Federal Government and it is intended that the Council shall be the co-ordinating agency for the promotion and development of research wherever possible throughout the whole of Canada.

As in previous years, the Council has concentrated its activities on the following three lines of work:—

(*a*) The training of research workers through the provision of bursaries, studentships and fellowships.

(*b*) The investigation of a number of special problems by the aid of grants to investigators, known as "Assisted Researches."

(*c*) The encouragement of development of research by the organisation of the research workers of Canada into Standing Associate Committee of the Research Council—and by the appointment of Special Committees to the same end.

(*a*) Training of Research Workers.

During the year 1923-24, 12 fellowships, eight studentships and 25 bursaries involving a total expenditure of $37,730 were granted. During the seven years since the inauguration of the scheme 103 grantees have completed their training under these awards. Of these, 21 are continuing their studies, 29 are engaged in the teaching profession, 17 are employed in industry, and 15 have accepted appointments in foreign countries.

(*b*) Assisted Researches.

The principal investigations conducted with the aid of grants from the Advisory Council during the year 1923-24 are the following:—

Means of increasing the nitrogen content of the soil.
The cultivation of drug-yielding plants of British Columbia.
The cascara content of the wood and back of *Rhamnus Purshiana*.
Corrosion of iron pipes in alkaline soils.
Preservation of structural steel.
Fog signalling by radio.
Colour vision defects.
Surface energy of crystals.
Spectrum of infra-red rays.
Helium researches.

(*c*) The Standing Associate Committee.

The Associate Biological Committee.—Researches undertaken by the Committee, in collaboration with the Committee on Marine Piling Investigations of the National Research Council, on the geographical extent of the spread of "ship worm" (*Teredo Navalis*) on the Atlantic and Pacific coasts of Canada have been continued.

The Committee has arranged for a chemical investigation of the problems relating to the curing and handling of fish.

The Associate Committee of Chemists.—The subjects considered by this Committee include the following:—

(1) Chemical aspects of fuel supply.
(2) The patent laws in relation to chemical inventions.
(3) Sulphide ores of British Columbia.
(4) Denaturing of alcohol for industrial purposes.
(5) Corrosion of iron and steel pipes in alkaline and clay soils.
(6) Utilisation of wood waste.
(7) The compilation of a catalogue of scientific periodicals.

The Associate Committee on Physics and Engineering Physics.—The Committee has been engaged chiefly with problems relating to radio and aeronautics, in co-operation with the Departments of National Defence and Marine and Fisheries. Other questions under review by the Committee included the publication of scientific papers in Canada, the status of radio engineering as a profession, and the necessity for the provision of a National Research Institute.

The Associate Committee on Mining and Metallurgy.—Arising from the work on the utilisation of low grade iron ores of Canada, a Sub-Committee has been formed to investigate the design and construction of blast furnaces necessary to meet the changed conditions arising form the use of beneficiated ores.

The Associate Committee on Food Research.—The Committee has continued its work in connection with the following investigations:—

(1) The preparation of vitamin B.

(2) Relationship between the yeast activator and the anti-neuritic compound.

The Associate Committee on the National Problems of the Fox Industry.—Experiments dealing with the food requirements of breeding foxes have been continued with the cordial support of the Fox Breeders' Association.

The Associate Committee on New Brunswick Forest. Problems.—Acting on representations made by the Department of Lands and Mines of the Province of New Brunswick, the Research Council has formed this Committee and made a grant of $5,000 to determine, if possible, methods and costs of reseeding recently burned land, old burns not restocking, and certain types of cut-over lands.

Preliminary results have been reported.

The Associate Air Research Committee.—During the year under review research has been carried out in the following subjects:—

Deterioration of lubricating oils at low temperatures.

Behaviour of rubber shock absorber cord at low temperatures.

Use of anti-freeze mixtures.

Development of radiators designed for use at low temperatures.

The reconstruction of the four-foot wind channel at the University of Toronto has been completed.

Finance.—As in previous years, Parliament granted an appropriation of $120,000 for the use of the Council during the session. The actual expenditure during the year was $125,317.06, and included the following items:

	$
Assisted Researches	59,854.04
Fellowships	13,380.00
Studentships	7,200.00
Bursaries	17,250.00
Salaries	15,091.37
Travelling Expenses	7,942.24
General Expenses	4,599.41
	$125,317.06

Research Council Act, 1924.

Since the issue of the report of the Honorary Advisory Council referred to above, the Research Council Act has become law (19th July, 1924).

The Council is constituted a body corporate and its membership is limited to 15, who shall be appointed by the Governor in Council on the recommendation of the Committee of the Privy Council on Scientific and Industrial Research. It is enacted that the President of the Council shall be the chief executive officer of the Council and shall have supervision over, and direction of the work of the Council and of the officers appointed for the purpose of carrying on the work of the Council.

It is declared that the duties of the Council shall include the charge of all matters affecting scientific and industrial research in Canada which may be assigned to it, and also the duty of advising the Committee of the Privy Council on Scientific and Industrial Research on questions of scientific and technological methods affecting the expansion of Canadian industries or the utilisation of the national resources of Canada.

The Council is authorised to undertake in such a way as may be deemed advisable:—

(i) The promotion of the utilisation of the natural resources of Canada.

(ii) Researches with the object of improving the technical processes and methods used in the industries of Canada, and of discovering processes and methods which may promote the expansion of existing or the development of new industries.

(iii) Researches with the view of utilising the waste products of said industries.

(iv) The investigation and determination of standards and methods of measurements, including length, volume, weight, mass, capacity, time, heat, light, electricity, magnetism, and other forms of energy, and the determination of physical constants and the fundamental properties of matter.

(v) The standardisation and certification of the scientific and technical apparatus and instruments for the Government service and for use in the industries of Canada; and the determination of the standards of quality of the materials used in the construction of public works and of the supplies used in the various branches of the Government service.

(vi) The investigation and standardisation, at the request of any of the industries of Canada, of the materials which are or may be used in, or are the products, of the industries making such a request.

(vii) Researches, the object of which is to improve conditions in agriculture.

(viii) The direction or supervision over researches under conditions to be determined in each case by or for single industrial firms, or by such organisations or persons, as may desire to avail themselves of the facilities offered for this purpose.

Discoveries and inventions made by members of the technical staff of the Council become the property of the Council and are made available to the public under such conditions and payment of fees or royalties or otherwise as the Council may determine, subject to the approval of the Governor in Council.

Mr. W. A. Wilson.

Memorandum Relating to Some Forms of Organization of Agriculture in Canada.

As a matter of information to the Committee it may be interesting to give a few general facts about Canada that may lead to a better understanding of conditions and work relating to agriculture.

Canada's area is 3,739,655 square miles, or 111,992 square miles larger than the United States, including Alaska. The land area is 2,306,502,308 acres: 358,162,190 acres possible farm land, 140,887,803 acres occupied. In eastern Canada, 50,095,406 acres occupied, 70,168,784 available for settlement. In the four Western Provinces, 90,792,397 acres are under occupation, and 147,106,603 acres, suitable for agriculture, await settlers. The gross agricultural wealth in 1925 was placed at $7,832,942,000, and by provinces:—

	$
Prince Edward Island	89,876,000
Nova Scotia	169,351,000
New Brunswick	177,037,000
Quebec	1,364,403,000
Ontario	2,196,152,000
Manitoba	696,495,000
Saskatchewan	1,826,833,000
Alberta	1,092,187,000
British Columbia	220,608,000

The gross agricultural revenue in 1925 was $1,708,567,000, and the per capita income of farmers was, in round figures, $2,000.

Co-operative Organisation for Marketing Wheat and Coarse Grains.

The Canadian Wheat Pool is a non-profit co-operative association with a membership of a hundred and thirty-eight thousand farmers in the three prairie provinces of Manitoba, Saskatchewan and Alberta. There are three provincial pools, each one a separate entity, self controlled in every respect, with its own plan of organization and management, its own officials administrating its own internal affairs and collecting its own grain. The Central Agency handles the grain collected by the three pools. This Central Selling Agency handled during the crop year 1925-1926 the enormous total of 215,016,000 bushels of grain, made up of 187,500,000 bushels wheat, 11,024,000 bushels oats, 13,221,000 bushels barley, 1,597,000 bushels flaxseed and 1,674,000 bushels rye.

The three provincial wheat pools handled more that 56 per cent. of the entire wheat crop of Western Canada. The approximate gross returns to the provincial pools was $271,500,000, of which $22,500,000 went to Manitoba, $188,500,000 to Saskatchewan and $60,500,000 to Alberta. This did not, of course, all go back to the farmers, as it included, for example, freight and local handling charges on wheat shipped through private elevators. Of the grain handled, 27,000,000 bushels went through Pool terminals. Shipments were made to 25 different countries. The overhead selling cost of the Central Selling Agency amounted to one-fifth of a cent per bushel.

The movement for a voluntary wheat pool was started as soon as the western farmers had to abandon their efforts for re-establishment of the Dominion Wheat Board, which handled, very much to their satisfaction, the entire wheat crop of Canada in 1919. Organization campaigns were conducted in the three provinces in the summer and fall of 1923, with fifty per cent. of the wheat acreage in each province set as the objective.

The Alberta Pool was the first to commence operations, with approximately 46 per cent. of the wheat acreage of the Province of 1923, or a total of two million, six hundred and two thousand, seven hundred and ninety-seven acres under contract. The first carload of Pool wheat was accepted on October 29th, 1923, and the world's largest co-operative marketing enterprise had hung out its shingle and started on its business career. Both the Manitoba and Saskatchewan Pool commenced operations the following fall.

Membership in the provincial Pools is open to those who are directly or indirectly engaged in the production of wheat. Every member on joining the pools pays $2.00 fee, which goes to pay organization expenses, and also pays $1.00 for a nominal share in the organization to comply with the company laws of the province. He signs a five-year contract binding himself to deliver all the wheat which he produces directly or indirectly to the Pool. All present contracts terminate with the 1927 crop. Those who joined the Pool since the first year have therefore signed only for the balance of the period. An exception to this is the case of members signing a contract with the Manitoba Pool in connection with the acquisition of pool elevators. All such contracts are for the full five-year period.

These contracts form the foundation of the organisation and through the democratic methods which prevail, in the election of delegates and directors to the central bodies, members are in continual touch with, and control of, the entire organisation. Each provincial pool is self-governing and while the general form of organisation, the terms of the contracts and the methods of business are similar in all three pools, there are certain differences in detail.

The provincial pool has full control of its members' wheat from the time of delivery at the country point of shipment until it reaches the terminal elevators at Fort William, of Vancouver, as the case may be. At these terminal points the grain is turned over to the Central Selling Agency which is under the control of a board of directors consisting of nine members, three from each of the provincial boards of directors.

The federal charter for the Canadian Co-operative Wheat Producers, Limited, the official title of the Central Agency, was issued in August, 1924. The keynote of the whole movement is outlined in the second clause of this charter, which states the purpose of the Central Selling Agency as follows:—

"To be an agricultural organisation for the purpose of mutual help to serve as the Central Marketing Organisation for the corporations and persons mentioned in section A thereof, but for no others; to improve methods and reduce costs of marketing grain, to reduce speculation, manipulation and waste, and all unnecessary transactions in such marketing; to increase consumption, build up new markets and develop new uses for grain; to market same directly and with regularity, so as to furnish it economically to the users thereof, and to preserve for the growers and the public their proper profits."

The Canadian Wheat Pool had no *elevators* when they started operations, but a clause in the contract provides for a deduction of two cents. per bushel for the purpose of acquiring facilities for the handling of grain. The Saskatchewan Pool constructed or purchased outright 90 elevators in 1924-25, and by an agreement with the shareholders purchased in 1926 for a little over eleven million dollars the Saskatchewan Co-operative Elevator Company's system, and now owns and operates 587 elevators including several terminals. The Alberta Pool already has 42 elevators under their control and have now decided to build or acquire one hundred additional country elevators in the province in time to handle the 1927 crop.

The Manitoba Pool now owns 30 elevators and should double this number by the end of the present year.

In addition, the Alberta Pool has leased the terminal elevator at Prince Rupert, and another at Vancouver. The terminal elevators owned by the Saskatchewan Co-operative Elevator Company system are included in the deal of eleven million dollars between the Pool and this company. The Central Selling Agency has three terminal elevators at Fort William, Ontario, with a total capacity of more than two million bushels.

Referring to the relationship of the Central Selling Agency to the Provincial Pools, E. B. Ramsay, member of the Central Board and secretary of that body, writes:—

"The Central Selling Agency is not an institution apart from the Provincial Associations, but is owned—lock, stock, and barrel—by them. The ownership is based on capital stock which is owned in the proportion of one-third by each of the three prairie pools, irrespective of the proportion of grain handled in the individual pools. The Central Selling Agency is directed by a Board which is nominated annually by the provincial associations, and each member pool nominates from its own board three representatives. These nine men constitute the governing body of the Central Selling Agency, and this system enables the Provincial Board to keep in close touch with all the policies and activities of the Central Selling Agency in a manner which would be impossible to a separate Board of Directors at Central. It also insured that the viewpoint of the country will be the guiding factor in determining the policies of the Central Board and maintain a unity throughout all pool developments which is an essential part of an organisation which, in three short years, has developed business activities in all parts of the wheat importing world."

Some Other Subject Headings Relating to Agriculture in Canada on which the witness is prepared to offer evidence.

Varied conditions in soil, climate, markets, etc.

Federal Government Activities concerning production, grading, standardising, markets and research.

Respective Provincial Government activities covering: production, education, research.

The relationship between Federal and Provincial official activities.

Wheat: grades, storage, transport, and marketing.

Other farm products: production, grades, storage, organisation and markets.

Oral Evidence.

56,570. *The Chairman*: Mr. Wilson, you are the Agricultural Products Representative of the Federal Government of Canada?—Yes.

56,571. Are you a member of the High Commissioner's staff?—Yes.

56,572. We have notes that you have been good enough to provide; would you like to add anything to those?—I would like to make a general statement. My purpose in opening this memorandum as I did was in a very brief way to show the diversity of the conditions in Canada with respect to agriculture and probably to give the Commission some idea as to the difficulties that would face anybody in preparing a general memorandum on agricultural work and organisation in Canada, because that organisation

and our marketing activities, production activities, education and research activities, vary according to the conditions that obtain in each Province. So that I set out those general conditions and the opening paragraph is a preliminary explanation of those circumstances, rather as an excuse for the memorandum that I did not prepare on general agricultural conditions, and also in the hope of bringing out the conditions in the discussion. Following that, I prepared a memorandum on the marketing activities in so far as they related to wheat and coarse grains, because that is by far the biggest organisation of its kind in Canada; I took that as an example and set it out more or less in detail. I merely made notes of some of the phases of agriculture that might be touched upon in the discussion.

56,573. We might take research first. I think you have a Central Research Council?—Yes, we have what we call the National Research Council, which is composed of officers from all the Universities in Canada; that embraces the Universities of the nine Provinces. I have a list of the officials of the National Research Council with their titles; I should be very glad to leave that with the Secretary if it will be of any value to you. This National Research Council has not very large funds at its disposal, and it acts more or less in an advisory capacity to anybody in Canada who is seeking advice, and acts as a pivot in Canada to distribute research work to the institution that is probably best fitted, both from the standpoint of men and equipment, to carry out that research work.

56,574. Has it funds at its disposal?—A very limited amount; I am speaking from memory; they had about 125,000 dollars in the fiscal year 1925-26.

56,575. Are there other funds available which are disbursed to some extent, at any rate, upon the advice of the National Research Council?—Not that I know of.

56,576. There is a Federal Department of Agriculture and to some extent a research staff under the Federal Government, is there not?—Yes, the Federal Department of Agriculture has jurisdiction over the experimental farms in Canada, and those experimental farms again are located in every Province in Canada, a central farm being located at Ottawa. They are all rather well equipped for carrying on agricultural research work.

56,577. Do the Provincial Governments take any part in the conduct of these central research stations in each Province?—Not so far as the Federal activities are concerned; Provincial Governments have their own research stations in conjunction with their agricultural colleges.

56,578. They are always quite separate?—They are always quite separate so far as administration is concerned; but they are always co-operating so far as discussion and arrangements and work are concerned.

56,579. In practice, is there friction between the officers of the Federal Government and the officers of the Provincial Governments?—I think not; I think there is a very happy situation throughout Canada in that respect.

56,580. What is the general policy of the Federal Government in the matter of research? Has it set down certain areas of research for itself, or does it seek to supply deficiencies in the provincial organisations?—It does both; for instance, in the case of rust in wheat in Western Canada, there is not only enlisted the help and co-operation of the Provincial Governments, but there is also co-operation with the Government of the United States, and conjointly they are carrying out work at the Agricultural College at Winnipeg on rust in wheat. That is only an example of

the means of co-operating between the Federal Government and the various Provincial Governments. These activities continue according as to whether a problem arises in any particular area in Canada.

56,581. Your Central Research Council is not responsible, in the administrative sense, for the conduct of these central research stations?—No.

56,582. On the other hand, it would be open, I take it, to the National Research Council to express an opinion as to the manner in which a particular field of research might be allocated as between provincial research stations and the federal research stations?—Quite right.

56,583. That would be an expression of opinion?—Yes, and sound technical advice because of the qualifications of the men who are in a position to give advice in that respect.

56,584. So that the prestige and authority of the National Research Council depends, to a very great extent, upon the reputation of the men who serve upon it?—I think you are quite right.

56,585. In practice can you tell the Commission whether the research departments in the Provinces are able to make detailed arrangements with the Federal Government's research stations in their department for team work on any particular problem?—I think there is very little active team work; the team work consists in consultation and arrangement. I know one particular case where the Federal Government staff has been drawn upon for conducting work in provincial fields; but these provincial colleges are fairly well staffed, and it is very seldom that they do call upon men from outside to assist them. The co-operation usually ends with the consultation, or in case any other problems come up during the conduct of the research where they require further advice, the actual carrying out of the work is usually done by the particular staff of the institution to which it is assigned.

56,586. So much about the help from the federal organisation to the provincial in terms of men; does the Federal Government give anything by way of grants to the Provincial research centres?—No; finance and authority are closely associated.

56,587. Is there a definite Research Service? So far as the personnel goes, are they members of a Service?—No, there is no definite research branch of any of the research stations.

56,588. Each department engages a man on a particular contract?—Yes.

56,589. And these positions do not carry pensions?—No.

56,590. *Professor Gangulee*: From where do you recruit these scientists?—They are recruited from many sources; some of them come from this country; some of them come from the United States; some of them come from the Continent; but most of them are our own production.

56,591. *The Chairman*: You have provided us with a memorandum entitled: "Note on Agricultural Legislation, Administration and Research in Canada," and on page 529 of that note you say the Research Council co-operates by the furnishing of funds to various institutions, both federal and provincial, and in some cases to individual persons, to enable them to conduct some line of research. Do all those funds come out of the 125,000 dollars which you have mentioned?—Yes.

56,592. That does not go very far in Canada?—No, it does not go very far; it really bears out what I have said, that the function is largely advisory, because they cannot do much with 125,000 dollars.

56,593. Is the National Research Council in touch with kindred bodies in Great Britain?—I think I can answer that in the affirmative but I do not know to what extent.

56,594. To leave for a moment the field of research, there are certain functions in the agricultural and veterinary field definitely committed to

the care of the Federal Government, are there not?—No; that is hardly correct.

56,595. I said outside the field of research?—Yes, you are quite right; the Federal Government has full jurisdiction over animal diseases, plant diseases, and so on.

56,596. Control in inter-provincial marketing?—Yes.

56,597. Control in export?—Yes, it covers the whole field of control.

56,598. Is that function of the Central Government one that is growing in importance?—I would not say it is growing in importance; its importance has been recognised in Canada for a good many years and the line of demarcation of authority has been fairly well defined for a good many years, so that I hardly see how its importance could grow. I mean it is well recognised already.

56,599. I was thinking of the extension of the principle of fixing standards of export?—That is entirely under the control of the Federal Government now. So far as exports are concerned, with all commodities it is purely under federal jurisdiction, and its development of that control in the export business is growing according as the sentiment of the people will permit it to grow. For instance, the export business in grading started in wheat a good many years ago. Now it has extended to hog products, to fruit, to canned fruit and vegetables, to dairy products, to poultry and eggs. We have pretty nearly covered the field, so far as regulation and standardisation of our farm products are concerned.

56,600. At least, the exercise of the control is tending to grow as time proceeds?—Yes, that is quite right. I think the world competition in these commodities is probably the secret of the whole development; it is a question of the survival of the fittest on the basis of the quality of the commodities.

56,601. You have a wheat pool in Canada?—Yes.

56,602. That is controlled by Government?—No, there is no official connection whatever. There are three provincial pools, those of Alberta, Saskatchewan and Manitoba. Then the central selling agency, which is the Canadian Co-operative Wheat Producers, Limited, has a Dominion Charter. Outside the charters, there is no official connection whatever; they are purely commercial organisations.

56,603. Is the co-operative movement in Canada making headway?—Yes, it is growing quite rapidly; more, comparatively, in Western Canada.

56,604. Has the credit society movement made headway in Canada? I am thinking of societies designed for the provision of credit to agriculturists?—Yes, it has made some headway; it is only progressing slowly. They have legislation in the three Western Provinces for agricultural credits; but that has only been within the last three years; I understand it has been quite popular and has been of very great benefit.

56,605. Have selling societies grown in number?—Yes, throughout Canada. They are of a varied character, depending upon the conditions that obtain in the respective areas in Canada. In the maritime Provinces they are rather small groups; the same applies in the Province of Quebec. When you come to Ontario they are somewhat larger. There is one co-operative company which is handling all lines of farm products and selling them for its clientele, which is second in volume to the Canadian wheat pool. When you pass on to Western Canada, they have pools relating to livestock, pools relating to dairy products, and pools relating to poultry and eggs. "Pool" is a common word in Canada; it is really synonymous with co-operative organisation, as spoken of in this and other countries.

56,606. Are these pools operated by co-operative societies?—Yes, producers' organisations, not assisted in any way by the Government, with one exception: the co-operative stockyards where livestock is concentrated for selling

by auction have received grants from the Provincial Government of Saskatchewan; that is the only co-operative organisation that has actually been assisted by grants. They are assisted by loans which are repayable over long periods and at a low rate of interest. Then, their business is conducted purely on a commercial basis; the directorates are largely composed of producers themselves, with a manager of wide experience. It is very seldom that a man is taken from the agricultural field to conduct these, although in the case of the wheat pools they are.

56,607. In the case of the wheat pools, who carried out and financed the preliminary propaganda required to assure the support of the sufficient proportion of producers to make a success of it?—Each Provincial Government gave an advance to the provisional directorate of the pool for organisation expenses, which I understand was given without interest but was repayable, and in all cases has been repaid.

56,608. I think fifty per cent. of the total production was thought to be the minimum?—It was based on acreage: fifty per cent. of the acreage was their minimum before they commenced operations; that was in each Province.

56,609. Can you tell us whether experience has borne out that view or whether rather less than fifty per cent. would have been sufficient?—They succeeded in getting the fifty per cent. before they started, and it has evidently proved to be enough, because they are approaching seventy-five per cent. of the acreage this year. I mean in 1926.

56,610. Within the pools?—Yes, within the pools. It evidently proved to be enough to make a satisfactory financial return on the product, otherwise they would not have had such a large acreage increase signed up subsequently.

56,611. Are the groups conducting the pools formed under a special Act of Parliament?—Yes, a Provincial Act of Parliament for each Province. The selling agency has a Federal Charter.

56,612. It is a combined selling agency under a Federal Charter?—Yes, there is only one selling agency for the three pools. When the wheat is delivered at the terminal elevators, the central selling agency takes charge for all three Provinces.

56,613. Does the central agency administer the terminal elevators?—No. Both terminal and up-country, or internal elevators, are operated by one or other of the provincial pools.

56,614. How about the element of management? Has that been a difficulty?—If it has been a difficulty, they have succeeded in keeping it from the public, because there has been no disturbance whatever.

56,615. What type of man supplies the managerial experience in the case of the pools?—In the case of the pools it is an actual farmer in each case. It is different when it comes to the selling agency; the selling agency manager is a man who has been taken from the commercial trade but is under the directorate, and every director is a farmer.

56,616. It is a farmers' committee in the case of the pools, is it?—Yes, each Province is divided into a certain number of areas. In Alberta, for instance, there are sixteen. Each area selects a Director to represent the central body, and from those sixteen central Directors, nine are elected for the Provincial pool. For the central selling agency three Directors are taken from each provincial pool and they form the directorate for the selling agency. All of these men are farmers themselves. The actual sales agent for the central agency is a man of wide experience who has been taken from the grain trade. The same applies to their overseas agents; they are all men who have been in the trade.

56,617. Are you familiar with the workings of any of the provincial colleges of agriculture?—Not intimately.

56,618. Do you know whether there is a tendency to confine appointments in those colleges to citizens of the particular Province in question?—I can answer that question quite definitely; there is not. They are looking for the best men. The one University and College that I know in particular has drawn some men from Scotland, it has drawn some men from two of the States of the United States; and the balance from Canada; but very few men from within their own Province; but I will say this, that where they have a student who shows promise, they have no hesitation in giving him a chance on the staff; they encourage that.

56,619. *Professor Gongulet*: The cattle quarantine and inspection in Canada, you say, is under federal control?—Yes.

56,620. What machinery has the Federal Government set up for its administration?—At certain ports of entry they have areas set aside which we call quarantine stations; they are used entirely for the receipt of cattle or livestock. We have a resident qualified veterinarian at these stations; he has the necessary staff, but he is also able to call upon any outside staff of the Federal Government in case of necessity.

56,621. That is, the federal authorities have to maintain their own staff in the Provinces?—Quite.

56,622. Is there any relationship with the provincial authorities?—None whatever.

56,623. I should like to get from you an idea of the experimental farm system of Canada. Under the Federal Government you have one central farm?—Yes.

56,624. That is situated at Ottawa?—Yes.

56,625. You have a number of special experimental stations such as horse-breeding stations; are these stations managed by the Federal Government?—We have not got any special stations for horse-breeding or for cattle breeding.

56,626. You have tobacco stations?—We have one, I would not call it a station, in Western Ontario which is really a subsidiary to the tobacco branch of the experimental farm at Ottawa.

56,627. Then each Province maintains a number of farms and experimental stations?—Yes.

56,628. Are the farms and the stations situated in the same locality?—The farms and the stations are together. Each college, for instance, will have a certain area, probably a thousand acres of land; they carry on their experiments in field husbandry, animal husbandry and so on; but it is under one Head and under one Board of Governors.

56,629. Is any experiment, suggested by the Central Government, being carried on on those provincial experimental farms?—Not that I know of. I should like to make one point clear. I am not sure that I understood your question. The Federal Government's farms in the respective Provinces conduct their work entirely on the programme laid out by the experimental farm at Ottawa; they are all federal farms; but in addition to that there are provincial agricultural colleges which have their farms; but they are under provincial jurisdiction and carry on their own work.

56,630. What relationship is there between the federal and provincial farms?—There is no connection, except in the matter of advisory and consultative capacities.

56,631. How do they divide the work? Is there no overlapping of work?—I presume there is some overlapping; there is bound to be; but I think that is at a minimum.

56,632. Do you say that in each Province there is one central farm?—Each Province has its agricultural college, yes.

56,633. A central farm?—Yes.

56,634. Under the Federal Government?—No, in the federal field there is the central experimental farm which is at Ottawa; they have their branch

experimental farms located in the different parts of Canada in the respective Provinces.

56,635. Under provincial management?—No, under federal management; then, in addition to that, each Province has its own agricultural college and farm where the experimental work is carried on as well, and educational work. These colleges were primarily established for educating the farmers' sons and others both for professional service and for going back to farms.

56,636. With regard to this wheat pool, what percentage of the total wheat production is marketed through this pool system?—I have not got the figures for production, but it is approximately seventy-five per cent. of the average of wheat that is sown.

56,637. Does the grower get a part of the value of his produce on delivery?—Yes.

56,638. So that if prices fall at the time of actual sales he has to suffer?—I do not quite follow your question.

56,639. Supposing that at the time of delivery prices rule high; if after three months the prices fall, what happens?—His original price is only an advance on account.

56,640. But he would have got the good price at the time of delivery if he sold his grain instead of joining the pool?—But he never gets a price equivalent to the market price.

56,641. What price does he get?—They have advanced one dollar as an original payment for the three years they have been operating.

56,642. At the time of delivery the grain is valued according to the market price?—No, they only get an advance. To show that this advance is based on the safe side: in the first year the final payment on the basis of No. 1 wheat was one dollar, sixty-six cents., but the only advance was one dollar. The pool made three subsequent payments. On the second year they have got a final price of one dollar forty-six cents.; so that the pool was advancing on the safe side.

56,643. *Mr. Kamat*: Is the farmer at harvest time bound to bring his wheat into the pool?—The farmer signs a contract, the actual signing of the contract is purely voluntary, but when he does sign it it is binding for five years; then he can bring in his wheat at any time he likes after harvest.

56,644. *Professor Gangulee*: It is purely on a commission basis then?—Yes.

56,645. Do you think the pool system in Canada exercises any influence in preventing a bad slump in prices?—I would say yes, very likely so.

56,646. How do you maintain the purity of varieties of wheat?—Our Canadian Wheat Growers' Association and our seed farms are doing a great deal to maintain the varieties, and of course the commercial value is influencing the farmers to such an extent that it needs very little control. The greater yield from the better varieties and the greater vitality of the seeds are factors which are determining the situation in a natural way.

56,647. *Mr. Calvert*: Could you give us a rough idea of the area of arable land which a Canadian farmer would hold? What would he plough a year?—I cannot give you that off-hand; I gave the Secretary some documents and that information is contained in them.

56,648. *The Chairman*: The typical holding?—Yes.

Sir Thomas Middleton: It varies very much in the Eastern and Western Provinces.

56,649. *Mr. Kamat*: Could you give us an idea of the total federal expenditure for the help of agriculture in Canada?—I am afraid I cannot give you those figures either; it is rather difficult to get out estimates for agriculture.

56,650. With regard to your system of marketing, is there any control, either by legislation or otherwise, from the Provincial Government?—None whatever, there is freedom of trading in every respect.

56,651. There is no legislative or executive control whatsoever?—None whatever; the only measure of control is after the farmer signs this wheat contract: then he is bound for five years to put his wheat through that channel; but he signs the contract voluntarily.

56,652. As regards the grading of wheat, in case of dispute what is the machinery provided for settlement?—From each load under mutual agreement, or in cases where there is disagreement between the owner of the grain and the elevator operator in regard to the grade or dockage, wheat may be delivered to the elevator subject to inspector's grade and dockage. In this case a sample is drawn from the load, which shall be satisfactory to both the owner and the elevator operator, and is forwarded to the chief inspector for his decision as to the proper grade and dockage. The Canada Grain Act, however, has the following clause respecting the handling of grain by this method:—

> "Where the disagreement as to grade and dockage arises on the sale of the grain by a farmer to such country elevator, the farmer shall be paid on the basis of grade and dockage offered him by the elevator, but the final settlement shall be made on the basis of grade and dockage given by the chief inspector."

56,653. Had your railway administration anything to do with elevators at the initial stage?—If they had, it was before my time and only in a very small way. I think probably the Canadian Pacific Railway Company in the very early stages had a few elevators, but they have none now and have not had any for years.

56,654. So that the present elevator system is almost independent of the railways?—Absolutely independent.

56,655. *Sir Thomas Middleton*: In connection with seed distribution, has the Canadian Government made use of schools for distributing seed, by giving the boys and girls new varieties?—No.

56,656. Was there not a considerable movement of that sort in Canada before the War?—There was a movement amongst the boys and girls, but it is altogether of an educational nature. That is growing very largely.

56,657. I understood that new varieties of seed were given to these children, that they were encouraged to grow them and to bring them to the notice of their parents?—That is quite right, but it is done for educational purposes.

56,658. But, as a matter of fact, it led to the introduction of a good many new varieties, especially of vegetable seeds, I think?—That I cannot say.

56,659. How long has the Research Council been in existence?—I think it was set up in 1918.

56,660. The main federal centre for both educational and research work, I think, is at Guelph, is it not?—No, the Guelph institution is a provincial institution; it is under the Ontario Government.

56,661. Does it not get federal grants?—No.

56,662. Canada has been expanding its area under tobacco in recent years a good deal?—Yes, very much so.

56,663. It is mainly pipe tobacco I understand?—Very largely so, yes.

56,664. But you have had a substantial growth in the volume of cigar leaf trade, have you not?—Yes.

56,665. Your market is the home market?—Yes.

56,666. In fact, you have a large home market, and you are not seeking an export market to any extent?—No, we are seeking an export market very much. Our production has increased so much this last five years that our export business has grown from a little less than a million pounds in

1920 to approximately five million pounds in 1926; I am speaking of exports to this country.

56,667. Of cigars or tobacco?—I am speaking of the raw tobacco.

56,668. My reference was to cigars; in that case your home market is sufficient and you were not exporting your cigars?—No, the duty is too heavy.

56,669. *Mr. Noyce*: Is agriculture mentioned in your Constitution?—I am afraid I cannot answer that question.

56,670. I was wondering if you could tell us whether there was a definite reference to it in the Act, showing how it was divided up between the Federal and the Provincial Governments?—No, I think I am correct in saying that in our Constitution, the British North America Act, there is no line of demarcation of activities set out as between federal and provincial authorities. I think the only point that is covered in the British North American Act is education.

56,671. Would you send us a copy of the British North America Act?—I shall be very pleased to make a note of it and in due course I will send it.

(*The witness withdrew.*)

Mr. A. E. JARRETT, of Jarrett Bros., London.

Note of Evidence.

Our firm of Jarrett Brothers, 91 and 93, Bishopsgate, E.C.2, has handled Indian cigars and cheroots for over 40 years and we are rather considered *the* East Indian Cigar Importing House. During the year 1892 we imported two million cigars from India, since when our imports have steadily declined, until in 1925 they only reached just over three quarters of a million cigars (786,000). In our opinion the outstanding cause of this decline has been the steady raising of the duty in this country from 5s. per lb. in 1897 to 12s. 11¼d. to-day. When the duty was 5s. per lb. a good Indian cigar or cheroot was sold at 2d. or 3d. each, but the same article can now only be sold at 4d. and 6d.

The following are the duties imposed since 1892:—

5s. 6d. per lb. to March 6th, 1900.
6s. per lb. on April 20th, 1904.
7s. per lb. on April 30th, 1909.
10s. 6d. per lb. on September 22nd, 1915.
14s. per lb. on May 3rd, 1917.
12s. 3d. per lb. on July 16th, 1917.
15s. 7d. per lb. on April 23rd, 1918.
Empire five-sixths of 15s. 7d., September 1st, 1919.
15s. 7d. plus 50 per cent. *ad valorem* Foreign, April 20th, 1920.
15s. 7d. plus 33⅓ per cent. *ad valorem* Empire, April 20th, 1920.
15s. 7d. No *ad valorem* from May 10th, 1921.
15s. 7d. Empire, ¼ Preference from July 1st, 1925, and silk duty.
16s. 10d. Foreign, April 11th, 1927.
12s. 11¼d. Empire, April 11th, 1927.

The next cause which we consider has sent the consumption down, is decline in the quality of the Indian tobacco. In our opinion the quality nowadays is very inferior to that of, say, the '90's: the Indian tobacco is coarser in flavour and rougher in texture than it used to be.

Another cause we think has been the enormous increase in the consumption of cigarettes by the smoking public.

It must be borne in mind that the liking for Indian cigars is very much of an acquired taste, and the roughness and appearance of very full flavour that all cigars made entirely of native Indian tobacco only possess acts as a deterrent to sales. For many years the cigar manufacturers in India have been meeting this difficulty by using imported tobacco for wrappers and blending purposes, and have succeeded in producing an excellent cigar of somewhat similar type to cigars made in England and they do, we understand, a very considerable trade in them in India, but unfortunately the duty on the " manufactured " Indian cigars of 12s. 11¼d. per lb. comes up against 8s. 2d. on the " unmanufactured " tobacco used in the British cigars.

Oral Evidence.

56,672. *The Chairman*: Mr. A. E. Jarrett, you are of Messrs. Jarrett Brothers, London; I think your firm handles Indian cigars and cheroots, and you yourself have had a long experience in trading in those commodities?—Yes.

56,673. You say in your note: " During the year 1892 we imported two million cigars from India, since when our imports have steadily declined, until in 1925 they only reached just over three quarters of a million cigars "?—That is so.

56,674. You give it as your opinion that the outstanding cause of that decline has been the steady raising of the duty in this country from 5s. per lb. in 1897 to 12s. 11¼d. to-day. You think, however, that another and quite different cause of this decline in imports has been a deterioration in quality?—Yes.

56,675. Can you account, at all, for that deterioration in quality? Is the tobacco that you used to get not now grown in India, or is it going somewhere else?—It is grown in India, but it seems to be a poorer quality, rougher, stronger, coarser.

56,676. You do not think the better quality leaf is now going somewhere else?—No, I think not, because Spencer and Company of Madras, the biggest manufacturers of Indian cigars, secure the very best leaf obtainable.

56,677. And yet another cause may, in your view, be a change in the public taste?—Yes. Probably you may have noticed the great quantity of cigarettes that are now smoked; since the War, practically, it seems to have come very much more in vogue.

56,678. You point out that cigar manufacturers in India have been meeting this difficulty attaching to a change in the public taste, by using imported tobacco for wrappers?—Yes.

56,679. And that by that means they have succeeded, to some extent, in satisfying the change in public taste?—Probably you might like to see the difference between the original country tobacco that used to come over and what comes over now. This box of cigars (produced) is called Trichinopoly tobacco, country tobacco. It used to come over like that, except that it was better; it was not so coarse; you never saw these rough grains in the tobacco when it came over from 1887 to 1892. Now this box (produced) is what is more satisfactory to the taste of the public here; that is a mixture of foreign tobacco with the Indian tobacco.

56,680. The foreign tobacco being outside?—Yes, and not only outside but probably a good deal inside. I do not know that I am justified in giving the percentage, but the Customs know it, so you may as well. In that particular cigar there is seventy-one per cent. of Indian tobacco, that is to say, the Trichinopoly tobacco. The remaining twenty-nine per cent. is what we call foreign tobacco; what the Customs call foreign tobacco.

56,681. *Sir Thomas Middleton*: Is that the same percentage as in the " Torpedo " cigar?—There is very little difference; it is a matter of one or two per cent. There is a difference of shape; the " Torpedo " is of course shaped like a torpedo, while this is more a bouquet shape.

56,682. Spencer's cigars will go up to a higher percentage than that?—We have one which goes up to sixty-four per cent. Of course the "Gold Mohur" is a hundred per cent.; that is to say, we get the full preferential duty on that. On the "Flor de Spencer No. 1" we get seventy-one per cent. preference and twenty-nine per cent. foreign; that is to say, we have to pay on seventy-one per cent. 12s. 11¼d., and on the twenty-nine per cent. the full duty of 16s. 10d.

56,683. *The Chairman*: Would it be true to say that the opportunity for Indian cigars in the British market rests in a peculiar degree upon their cheapness?—It used to a great deal: on their cheapness and good value. In the days when the duty was 5s. and 5s. 6d. per lb., the "Gold Mohur" cigar used to be sold in the shops at 5 for a shilling or 3d. each. Now those cigars are sold at 6d.

56,684. Is the public prepared to pay that price for that class of cigar?—No, they are not; that is the trouble; there is a great deal of falling off. I do not know whether you gentlemen find in your smoking that cigars are expensive.

56,685. *Dr. Hyder*: When you say there has been a change in taste (you say somewhere in your note that there has been an increase in the number of people who smoke cigarettes), do you mean that people who smoked cigars have now turned to cigarettes, or do you mean that the increase in the total quantity of cigarettes consumed is owing to the extension of smoking?—Yes, there are a good many more smokers of cigarettes, for a good many reasons; one is that they like them better. I do not know whether you have noticed that if you invite young men to a dinner party and offer them a cigar or a cigarette, they will invariably take the cigarette, while older gentlemen will take a cigar.

The objection to a cigar is that you cannot get rid of it so easily.

56,686. *Sir James Mackenna*: The old cigar-smoker now smokes a pipe because he cannot afford a cigar, while the man who is starting smoking takes to cigarettes?—The younger men who went to the War started smoking cigarettes then and they have stuck to it. I think that is one of the reasons. There has been a falling off in the quality of Indian cigars, but I think the decrease in sales has been largely caused by the change of fashion. Here is a British cigar which pays about 8s. 10d. duty; the preferential duty on the Indian cigars works out at 12s. 11¼d., so that we have to pay practically fifty per cent. more duty on our Indian cigars, which is something in itself.

56,687. *Dr. Hyder*: What is the price of this English cigar?—That cigar is sold to the shops at somewhere in the region of 45s. per hundred, while one of the dearest cigars that Spencers make is sold at 41s. A great deal of foreign tobacco is contained in it to make it palatable here.

56,688. *The Chairman*: When I said that the opportunities of this class of tobacco depend in a peculiar degree upon cheapness, what I was thinking of was this: in the case of a man who is prepared to pay 1s. 6d. for a cigar, he is going to have a cigar anyhow, but I should imagine there are people who smoke cigarettes, but who, if they could buy a cigar of the class you have shown us at an extremely cheap rate, might be willing on occasions to treat themselves to one?—I think so distinctly.

56,689. Instead of smoking cigarettes?—Yes. In 1890 the working man on a Saturday night used to go into the shop and buy seven cigars for a shilling. Probably you would not like to walk behind him while he was smoking one of them, but that is what he bought. A man in a sphere of life a little above him would buy cigars at five a shilling, and so on.

56,690. In this matter of duty, the present position is that the natural rate of duty stands at 16s. 10d. per lb.?—Yes; it was 15s. 7d.

56,691. Have you considered, at all, what the effect of a change in the basis of taxation from one of weight to one of value might be?—Of course

it would make a very great difference as far as we are concerned, dealing in "Indians." They had an *ad valorem* duty in 1920; I think Mr. Bonar Law was the Prime Minister then; I am not certain whether Mr. Austen Chamberlain was the Chancellor of the Exchequer. It was such a ghastly failure that they removed it the next year; the trade was practically crippled through it; but that told more particularly on the Havana and the dearer cigars.

56,692. What effect did it have on the sale of your Indian cigars?—It very much decreased it. I wrote a letter to Mr. Bonar Law on the subject.

56,693. *Sir Thomas Middleton*: But that *ad valorem* duty was in addition to the weight duty?—Yes.

56,694. It was the very heavy total tax that nearly killed the cigar trade?—Yes, the total tax. In that year the duty was 15s. 7d., plus 50 per cent. *ad valorem* duty, except on the Empire, and that was 33⅓.

56,695. *The Chairman*: There is the other possible course, of shifting the existing rate of taxation in part or in whole, from the basis of weight to the basis of *ad valorem*?—That would make a very great difference altogether then.

56,696. That would favour the Indian cigars?—Distinctly. I will not give the figures as to the price in bond, because it is a little difficult to get at it right off, but we will suppose that country tobacco cigars are sold now at 7s. 6d. per hundred; the *ad valorem* duty would make it very considerably less. Havanas would probably cost 50s. in bond, and Indians would cost 7s. 6d. But the trade would never agree to *ad valorem* duty; they would say we were favoured and that it was all against British manufacture as well, the British manufactured paying 8s. 10d. duty. Of course, it would be very, very much better for Indian cigars if we could have an *ad valorem* duty.

56,697. Have you considered, at all, the organisation of the tobacco-growing industry in India? Are you familiar with that?—I would rather not enter into that, because we have never professed to know about the growing of the tobacco out in India. We have only seen the raw leaf coming over here. I should know a country tobacco cigar by opening it; I should know that was Trichinopoly; but beyond that I do not know anything about it beyond the ordinary growing of tobacco. I only know this, that the peculiar tobacco of India is probably caused by the atmosphere and climatic influences, and also the soil; because in every country you go to you find a difference in the flavour of the cigars.

56,698. Have you any means by which you can bring the demands of the consumer in this country to the notice of those in India whose interest it is to suit that demand?—That cigar I have shown you has been the result of our suggestions in the past to get something more suitable to the taste of the public.

56,699. How have you achieved that?—At one time there was quite a boom in these cigars.

56,700. How have you achieved the connection?—By appealing to Spencer & Company, our friends, to go into the question of blending. The actual tobacco itself you could never get more popular than it is.

56,701. You have corresponded with the Indian manufacturers of these cigars?—Yes; they are personal friends of ours, and we can speak to them as comfortably as one would to a brother. We did all we could to assist in that way to make them popular. Of course, there is always a certain amount of roughness in the ordinary tobacco which does not appeal to the smoker. The smoker when he takes a cigar looks at it to see if it is a good shape and so on. Some cigars condemn themselves to look at though they are not bad cigars.

56,702. Have you any suggestions to make, apart from those in your note, as to how this decline of the import into Great Britain of Indian

cigars might be arrested and the process, if possible, reversed?—We are always struggling to improve business in the best way we can. We tried propaganda some time ago, but it was an expensive undertaking without any result. At the moment, cigar-smoking is on the down grade, there is no doubt about it; whether it is because cigars are too dear or whether it is that it is not fashionable I do not know. Perhaps it is that a man wants to sit with the ladies after dinner and smoke cigarettes together for the sake of companionship; I do not know what it is, but the result is that cigars are not as popular as they were. The cigars themselves are equally as good as they were in the past. I am not referring only to our Indian cigars, because it refers to Havanas, which we deal in, Manilas and every branch of the importing trade. There is a falling off in the consumption of cigars; we all put it down to one cause: the dearness of cigars. Men nowadays go out in their cars; they do not smoke cigars in their cars; they smoke a pipe. In the old days there were no such things as cars and they stayed at home and enjoyed smoking a cigar. That falling off is not peculiar to the Indian cigar; it is general. When you have a falling off from two millions to three-quarters of a million, it must make a great difference to our profits

56,703. If it is not an indiscreet question, was it your firm that carried out the very expensive campaign advertising "Flor de Dindigul" cigars?—We (i.e., Spencer & Co.) made the "Flor de Dindigul." When they were sold at five a shilling they went by the hundreds of thousands, in fact by the million; but the duty went up and now they are in as bad a way as any other cigar.

56,704. Have Indians fallen off more than other makes?—No, I do not think so.

56,705. They have had their share of the bad times, but no more than their share?—Yes.

56,706. *Sir Thomas Middleton*: If you take a cigar such as this "Flor de Spencer"; it is sold, you say, at about 45s. per hundred?—It is sold to the shops at about 45s.

56,707. What is the weight of a hundred of these cigars?—The duty on that particular one would be in the region of £1 10s.

56,708. That is to say, two-thirds of the retail price in this country is duty?—Two-thirds on that particular one.

56,709. Now if you take, say, a Corona of about the same size, about one-tenth will be duty?—The Coronas, duty paid in bond, would probably work out at about 177s. The duty would be about 30s. on 177s.

56,710. What would be the shop price?—I am giving you the shop price now. 177s.

56,711. That is about one-sixth?—A fifth or a sixth.

56,712. In what way does the duty affect the total consumption of cigars?—It not only increases the cost to the London retail shop, but it increases the cost of retailing, and therefore you have not only an addition of 30s. to the price for duty, but you have an addition of a sum which the retailer requires because of the reduction in his turnover and the increased locking up of his capital.

56,713. What would be the effect on the retail price if the duty, instead of being 30s., were 15s.? Have you from your experience any idea how that would affect the consumption?—It would bring down the net cost of this cigar to 30s. I think it stands to reason if those are sold probably at 7d. or 8d. now, as they are, and they could be sold, as you say, at your price of 30s., they would then be sold at about 4d. or 5d.

56,714. I was thinking of what you told us about the pre-War state of things, when cigars were bought by the working man for seven a shilling on Saturday night. These were cigars at 20s. a hundred. Taking cost

of living generally as having gone up by fifty per cent. and cigars from 20*s.* to 30*s.*, do you think you would have the same custom for these cigars as you had before the War if you could sell them at 30s.?—You have got to bear in mind the change of fashion. Of course, it would be very helpful to the cigar trade if the duty were reduced, because without a doubt, the cheaper the article the better the sale; but there is the fashion to be considered as well.

56,715. You do not think the fashion has been largely made by the price?—No, I think the fashion really and truly was caused by the War, the men got into the habit of smoking cigarettes during the War and it has increased everywhere.

56,716. You said that an *ad valorem* duty would upset the manufacturers in this country, but the lowest point of duty would be that on unmanufactured tobacco?—I do not think they put the *ad valorem* duty on the raw material; they put it on the imported cigar.

56,717. That is so, during the War; but if, instead of a duty by weight, we had now an *ad valorem* duty, that *ad valorem duty* on manufactured goods could not start below 8s. 10d., which is the duty on the foreign leaf?—Yes, as it is used by the British manufacturer.

56,718. So that, except that it would bring him into competition with the Indian cigar maker, I do not see that the British cigar maker would have anything to grumble about?—No, not at all, if it was started on the basis of, we will say, 8s. 10d., he should not have anything to complain of, because other things are equal, except that they are not quite equal in this respect, that our Indian tobacco is one of the cheapest tobaccos in the world.

56,719. He can use it too?—He can use it too; he has a chance of using it if he chooses.

56,720. As it brings him fresh competition he would object to it, but he has no other reason?—No, he has no reason at all, because he is on all fours with the importer.

56,721. The Indian manufacturer now has a very wide range of qualities; he has greatly extended his range in cigars in the last thirty years or so?—Yes.

56,722. He makes cigars ranging from a hundred per cent. Indian leaf to twenty or thirty per cent. Indian leaf with seventy or eighty per cent. foreign?—We have actually got two cigars up to ninety-one per cent. foreign, but there is no sale for them. Take it roughly at from twenty-nine to thirty-six on the ordinary selling stuff.

56,723. The Indian cigar trade to this country is a very small one? It is about 39,000 lbs. annually at present; it has varied from this amount up to about 80,000 lbs. in the past five years. These are the total British imports of Indian cigars. But there is a large market for Indian cigars in other parts of the world?—Yes.

56,724. The Straits Settlements and Federated Malay States is the chief market?—My son is in the Civil Service there and he tells me they smoke mostly Manilas.

56,725. They took 250,000 lbs. weight of Indian cigars in 1925-26; that is about six times as much as Britain took?—I am not quite certain what the duty is into the Federated Malay States, but it is very small except in the protected States, and they put more duty on.

56,726. It is evident that the Indian manufacturer can suit the tastes of quite a wide range of customers?—Yes, but then you must bear in mind that the Indian cigar is a cigar that is smoked by men out in the East. It is a curious thing that when they smoke the Indian cigars they come over here and say there is nothing like the Indian cigar; they stick to that opinion for about six months or a year; but then, in this climate they find it does not quite suit their palate so well and they gradually go off

to a Havana. On the other hand, out in the East the Indian or Manila cigar is more suitable, because it is the cigar of the country, just the same as the wine of a country is suitable to the people in that country. That is why I think the Federated Malay States take that fair quantity. The Havana cigars would not keep out there.

56,727. *Mr. Hyder*: Is the whole of this trade concentrated in the hands of your firm or are there many other firms importing Indian cigars?—I think the only other firms in London besides ourselves are Bewlay's and MacDowell's. There are a few in Glasgow who import Burmas.

56,728. You import Madras cigars?—Yes.

56,729. And the people in Glasgow import Burma cigars?—They import Burma chiefly. We import Burma's as well, of course.

56,730. I find from figures here that the share of the United Kingdom was in 1922-23, 16.6 per cent. of the total quantity exported, and the rest went to the countries which have been mentioned by Sir Thomas Middleton. Those figures relate to the export of Indian tobacco. The share of the United Kingdom seems to be constant; it does not change very much. Is that not so?—Since about 1923 it has been practically stationary; it has not gone ahead or gone back much.

56,731. What is the value of these cigars when they are landed here before you pay Customs duty?—The duty on the "Gold Mohurs," with preference, would be £1 3s. 6d. They are sold in the shops at £1 13s. 6d. The tobacco is grown, manufactured, sent over here, sold by us to the shops and stores, all for the sum of 10s., so that I do not think we are profiteers.

56,732. *Mr. Noyce*: The position is that if you buy a Havana cigar you get five-sixths value and you pay one-sixth duty?—I do not say you get five-sixths value; you get five-sixths of cost.

56,733. You get five-sixths of what we might call commercial value?—Yes.

56,734. It is five-sixths cigar and one-sixth duty?—Yes.

56,735. With an India cigar it is one-third value and two-thirds duty?—Yes, that is about what it is.

56,736. Do not you think the consumer in this country must realise that and know that if he buys a good cigar he is not presenting Government with much the greater part of what he pays for it?—They should realise that, but unfortunately they say they cannot afford to smoke cigars.

56,737. That is exactly the point; if two-thirds of the cost of the cigars goes to Government in duty, they are not prepared to smoke it?—That is so.

56,738. Am I right in the inference that practically the whole of the export of cigars from Indian proper to this country is in the hands of one firm; that Spencer & Company are practically the only exporters?—I do not know whether they do now, but some little while back Spencer & Company had a thousand men working daily making cigars; they supply all the railways of India, all the restaurant cars and practically all the East: Australia, South Africa and ourselves.

56,739. I am referring to exports to this country; they are the only firm that export to this country?—Practically the only one.

56,740. *Sir Thomas Middleton*: There are MacDowell's also?—We look upon MacDowells as a competitor, but we do not look upon them as a very serious competitor.

56,741. *Mr. Noyce*: Have you any experience of Indian pipe or cigarette tobacco?—We have had some cigarettes, but it is rather strong for cigarettes; they use a great deal of it in France; it is black.

56,742. After all, there is an enormous consumption, in India, of cigarettes manufactured from Indian tobacco?—Yes, but they are chiefly smoked by Indians, are they not?—I think you will find none of the Europeans smoking them.

56,743. *Sir James MacKenna*: Is there any export of cigars to the Continental countries, say France? There used to be during the War; is there none now?—No, they do not allow us to now; we can get in just a couple of hundred to the men on the Rhine or in the Ruhr District, and that sort of thing. Officers in the Army get them over; apart from that they do not allow any of them over. We cannot export to Europe at all.

56,744. Have you any experience of that very finished product, the Burma cheroot?—Yes.

56,745. Do you import any of them?—Yes, hundreds of thousands.

56,746. Not now?—Yes, hundreds of thousands. I dare say we import a great many more "Burmans" now than "Indians"; I do not know why it is. Scotch people smoke the Burma cheroots; we sell many of them in Glasgow, but unfortunately they cut the price very heavily.

56,747. Is the trade still big?—Very big indeed.

56,748. Your total last year was three-quarters of a million of "Indians"; if you sell "Burmas" by the million, what you lose on the swings you must make on the roundabouts?—We get 20 cases at a time of 10,000 each, Scotts No. 1, P.W.E. No. 1, and Pathans. We have three brands.

56,749. It takes a man to smoke a Scott No. 1?—Yes, it does. Scott No. 1 spoils the shape of the mouth, it is so big, but the Scotsmen like them.

56,750. The duty on them is very heavy, they weigh so much?—Yes, they weigh heavy; they weight two-and-a-half lbs. to the hundred. The duty on Scott No. 1 is £1 12s. 6d. on a box of a hundred.

56,751. We must infer from the supply of "Burmas" into Scotland that the local customs in Scotland are rather different from those in England?—The Burma is more suitable in Scotland where the air is clearer and the whisky is stronger; which makes the cigar more palatable.

56,752. That is the one gleam of hope in the Indian cigar industry?—It is. As a matter of fact, honestly, our best brands of "Burmas" we cannot get over quickly enough; we pay for the goods in advance and we cannot get them over. We only go in for the very best tobacco. That would be grown by the individual farmers; we then take all that they make, whatever it is.

56,753. Is the outside leaf Burma too?—Absolutely; they do not add anything foreign in Burma at all.

56,754. Do you know what the retail price of Scott No. 1 is; I mean the top price? Before the War I got them at five for 1s. 0½d. in Glasgow?—That was No. 2; you would not get No. 1 at that price.

56,755. What do they sell at now; at 9d.?—They should, but Glasgow is a peculiar place; they cut the price, and I believe you can get them anywhere from 7d. to 8d.

56,756. *Professor Gangulee*: Judging from advertisements, it appears that the tobacco trade lives on publicity. Has Indian tobacco received its share of publicity in the London market?—I suppose there is no trade that advertises more, if you think of the cigarettes that are advertised. If you cut away all the "Woodbines," "Gold Flake" and all the Wills' tobacco, then I will not say anything about whether you get enough publicity; but I do not think there is any trade which is more advertised than the cigarette trade. After all is said and done, one only advertises an article that goes; if you want to push an article you advertise it.

56,757. Do you know anything about the Empire Marketing Board?—I know we sent an exhibit to the High Commissioner.

56,758. That was at the last tobacco exhibition at Olympia?—Yes.

56,759. The great bulk of your export from India is unmanufactured tobacco, not cigars?—We import cigars.

56,760. But tobacco is exported from India in an unmanufactured condition, the raw leaf, rather than in such forms as cigars?—Yes.

56,761. I find, for instance, that out of 38 million pounds of total tobacco exports from India, 12 million pounds were taken over by the United Kingdom?—Yes.

56,762. So that the bulk of your import trade in Indian tobacco is in raw leaf?—Yes.

56,763. Have you any experience of the raw leaf imported from India? Could you tell us something about its quality?—I know a good piece of Indian tobacco, naturally, because that has been my business for the last 40 odd years; but I know nothing about the growing of it; I only know the quality of it.

56,764. What do you think of the present methods of curing? Are you satisfied with the quality of tobacco obtained from them?—Now you are going into the manufacture on the other side, which I do not like to go into because I am not fully competent to do so. Of course, it is only a pious opinion, but I imagine it could be very much improved; but whether it could be made a paying proposition I do not know.

56,765. Is your market satisfied with our raw leaf tobacco?—Yes, because it answers the purpose.

56,766. Are you satisfied that the grading is satisfactory?—I believe the grading is satisfactory.

56,767. India is described as the senior partner in Empire tobacco growing?—Yes.

56,768. Under what conditions of trade will she be able to retain her position as such? I am referring to unmanufactured tobacco imported from India?—I am not talking about the European tobacco, but I imagine that Indian tobacco would be the lowest grade of any tobacco that comes into this country.

56,769. You have been in the trade for a large number of years; do you find any improvement or any deterioration in the quality of Indian tobacco?—I imagine it has not improved, because if it had improved, our trade would have improved.

56,770. So that it has not improved?—Our cigars have not improved, and I take it that they select from the very best tobacco.

56,771. In recent years Rhodesia, Canada, Nyasaland and all these countries are growing tobacco on a large acreage?—Yes.

56,772. Do you think that India will be faced with serious competitors, in the future, in these countries?—It is rather a peculiar thing, but in Rhodesia and that part of Africa they bring seeds over from Turkey, from Havana and from Virginia; they plant them there, and really they have been most successful in getting a similar character of tobacco as is grown in those countries I have mentioned. But if you grow a Virginia seed in Havana, you will get the flavour of the country of origin in that year. If you take the seed from that first year's growth of the plant that is grown in India from that seed, we will say Virginia, in the following year it will go back to its original flavour, that is to say, Indian flavour. That is one of the troubles we have got to try and overcome in India: to get something which will compete with the tobaccos from these countries; we must try to discover some means of making the soil develop the seed and give the tobacco a flavour like that of the country of origin, because our experience is that it dies out in the second year.

56,773. Have you come across any improved variety of tobacco in your trade with India, any improved leaf?—No, we do not touch the leaf except in the manufactured form, and we have not seen any improvement in that.

56,774. *Mr. Kamat*: Is the cigar manufacturer's trade here an organised trade? Have you an association or a combination?—We have an Associa-

tion of Havana Importers; there are 16 or 17 of us who are Havana importers; there are no other importers in the country.

56,775. As importers, not as manufacturers here?—We are an Importers' Association in Havanas, but as far as India is concerned, there is no need for an organisation, because we are alone, excepting, as Sir Thomas Middleton said, MacDowells and Bewlays.

56,776. May it not be that this is one of the causes of your being pushed to the wall in the sphere of publicity, as compared with cigarettes?—No, I am afraid it is not so.

56,777. Is not it due to the fact that you are a weaker organisation compared with the cigarette manufacturers?—Our travellers call round on every shop of importance in the United Kingdom and they do their level best to push Indian cigars, because we have got a bigger stake in the Indian branch of the business than any other firm, but I do not think, with all that pushing, that it can be increased.

56,778. Has your Importers' Association ever tried to carry on an agitation or a campaign in the Press against this heavy duty on Indian cigars?—Yes, last year we had a committee, and we saw the Chancellor of the Exchequer; he smiled at us, but the duty was put up. We also saw Lord Birkenhead; we had him to lunch; he was very pleased to be with us and said he would do his level best for us, but he increased the duty 1s. 3d. We approached every source we could.

56,779. You have explored every avenue?—Yes, and we pointed out most of the things that I have pointed out to you gentlemen, but it had no effect.

56,780. *Sir Thomas Middleton*: What did you ask the Chancellor of the Exchequer to do: to reduce the duty or to impose an *ad valorem* duty?—No, when we saw the Chancellor of the Exchequer it was only with reference to Havanas, not with reference to "Indians." But previously, when Mr. Bonar Law was Prime Minister, we wrote him a letter pointing out the difference, that whereas in a Havana cigar the first cost is five times more than the duty, the reverse is true of the Indian cigar, where the duty is five times the cost of the cigar. The *ad valorem* duty would do very well in our case, but it killed the trade at the time in Havanas.

56,781. *The Chairman*: Sir Thomas Middleton suggested that the decrease in the turnover in Indian cigars must necessarily increase the selling cost. I suppose, in practice, the retailer makes up on the increased sale of cigarettes what he loses in the decreased sale of cigars?—Yes, otherwise you would not find that the Customs revenue had gone up so much.

56,782. The contraction in the business in Indian cigars must to some extent increase the cost of selling, must it not?—Yes.

56,783. But from the retailer's point of view, since he sells not only Indian cigars but also cigarettes and other tobacco, that increase is not an important consideration?—No, he does not mind much; he does not particularly care whether he sells pouches, pipes, cigarettes or anything as long as he gets a sufficient turnover all round; and, as has happened, the cigarettes have made up for the falling-off in the sale of cigars, and more, because women now smoke cigarettes.

56,784. *Sir Thomas Middleton*: But the retailer does not like to stock boxes of cigars which are not sold; he must look to the turnover of cigars?—Yes.

56,785. And if he makes more profit on cigarettes, obviously he will deal more in cigarettes and reduce his stock of cigars?—He does and has done so.

56,786. My point is that a retailer looks at the increased cost due to the duty as an impediment to his sale; therefore he adds to the difference between his wholesale price and his retail price to recoup him for the reduced turnover. At present the retailer adds probably 5s. a hundred

to Flor de Spencer cigars, but if he could sell three boxes instead of one in the day or the hour, he would reduce his 5s. charge to something like 3s. or 2s.?—Yes.

56,787. *The Chairman*: Has the retail margin on Indian cigars increased as a consequence of the restriction in business in Indian cigars?—No, I think not; I think the average shopkeeper expects to make twenty-five per cent. gross profit.

56,788. How does that compare with the gross profit he aimed at before the increase in duty and the decrease in consumption?—I think they always went on the same lines of making the same profits.

Sir Thomas Middleton: He has got to make his profit on the duty as well as on the raw material.

Mr. Calvert: He is getting more profit per cigar; he is not cutting his profits down because of the increased duty.

Sir Thomas Middleton: No.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Wednesday, the* 29*th June*, 1927.

Wednesday, June 29th, 1927.
LONDON.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } *Joint Secretaries.*

Sir THOMAS WARD, Kt., C.I.E., M.V.O., and Sir FREDERICK GEBBIE, Kt., C.I.E.

NOTE OF EVIDENCE.

We are of opinion that it is very desirable that there should be co-ordination in matters relating to irrigation between the various Provinces in India, so that the information and experience gained in one Province may be readily available in others. This has hitherto been accomplished through the Inspector-General of Irrigation in India. It may be noticed that the post of Secretary to the Government of India, Public Works Department, and of Inspector-General of Irrigation in India was a combined appointment until about 1905, when the large increase of work brought by the recommendations of the Irrigation Commission necessitated a separation of the duties. Since the Reforms the Inspector-General of Irrigation has been replaced by the Consulting Engineer who, as an official of the Central Government, is not in a position to obtain the information.

Although the Government of India still provide funds on demand they are loans to the Province concerned, not, as formerly, sums paid to construct works that became the property of the Government of India. The Consulting Engineer, therefore, cannot go to inspect works as a matter of right.

We understand the present proposal is to appoint two Chief Engineers from the Provinces to sit with the Consulting Engineer as a committee to advise on the projects submitted and to advise on irrigation matters in general. The Inspector-General of Irrigation in India was the final authority on the technical side of projects, but now that the duties of Consulting Engineer are combined with those of the Deputy-Secretary he may not be of sufficient technical experience to discharge this responsibility, hence perhaps the proposal to appoint the committee.

Ordinarily speaking, technical information is obtained by altruistic institutions from its members and opportunities are provided for criticism, and the Inspector-General of Irrigation in India obtained his information and rendered his service of advice in much the same way. The stimulus

in the first case, beyond the altruistic appeal that exists in all good craftsmen, was an appreciative audience and valuable and highly prized medals; in the latter the personality of the Inspector-General of Irrigation. If the information is ordered, as for instance by the editor of a technical publication, payment will be expected: should Local Governments be called on to furnish this, questions of staff are almost sure to arise. Some form of authoritative order will be needed or the request will soon be evaded. No stimulation can be hoped for from counsels of perfection where routine duties are required to be rendered to the shelves of a record room.

Some of the most important information is statistical, which is only valuable if collected methodically over a long series of years. In the past the statistics to be included in the annual irrigation administration reports of the Local Governments was laid down by the Government of India and was the same in all the Provinces. A feature of a canal in one Province could be readily compared with that of one in another. Projects for new canals were, and still are, prepared from the statistics thus maintained of similar existing canals. When the Assistant Inspector-General of Irrigation in India was appointed in 1920, it was intended to utilise the opportunities of the Inspector-General of Irrigation in India to obtain technical information, to co-ordinate this in a series of technical papers somewhat similar to those issued by the Railway Department towards the end of the last century, that owed their inception and existence to the personality of the late Mr. C. W. Hodson, C.S.I., and which were abolished by the Railway Board when it was constituted as being outside the scope of a governing body. It should perhaps be noticed, here, that the Inspector-General of Irrigation in India organised irrigation conferences in 1904 and again in 1913 to provide the same service and in addition criticism; it was intended at the time to hold these as the accumulation of material demanded and opportunity offered.

It would seem necessary, therefore, to consider the respective responsibilities of the Supreme and Local Governments in the irrigation works; the organisation for this should, and doubtless will, provide the information officially needed. What more is required from the irrigation authorities for the general good of the country and the well-being of the people can perhaps best be considered and dealt with under statistics and research.

Oral Evidence.

56,789. *The Chairman*: Sir Thomas Ward, you were Inspector-General of Irrigation from 1917 to 1920?—(*Sir Thomas Ward*) Yes.

56,790. And you, Sir Frederick Gebbie, were Inspector-General from 1921 to 1923?—(*Sir Frederick Gebbie*) Yes.

56,791. You were also Consulting Engineer to the Government of India from 1923 to 1927, the date of your retirement?—That is not quite correct; up to April, 1925.

56,792. Sir Thomas, perhaps you would give us the details of your previous service in India?—(*Sir Thomas Ward*) I have been connected with the Punjab throughout my service. I was on some deputations, while in India, to the Foreign Department and to the Home Department and so on, with regard to special matters, and then I went down to Siam.

56,793. May we have your previous service, Sir Frederick?—(*Sir Frederick Gebbie*) I was mostly in Sind. I was there for 22 years. Afterwards I was in Bombay as Chief Engineer and Secretary to the Government, and afterwards to the Government of India.

56,794 I understand it is convenient for you two gentlemen to be examined together. I should like a little more enlightenment upon your

views as to the need for some officer or body responsible to the Government of India, whose principal function would be to adjudicate as between two Provinces when the interests of those two Provinces in the matter of irrigation are not exactly parallel; that is to say, when differences of opinion arise, and when the two Provinces are not able to come to a full and friendly settlement between themselves. Do you think that is best obtained by an individual officer responsible to the Government of India, or do you think, under existing constitutional conditions, it is better to rely upon a Committee?—(*Sir Thomas Ward*) Sir Frederick Gebbie has more recent experience than I have, and perhaps it would be more convenient if he gave his views, and if I added any remarks which I found necessary. (*Sir Frederick Gebbie*) If the conditions now are the same as they were when I was in India (although I understand they have gone a stage or two stages further), I do not think the Government of India has any authority to appoint anyone to adjudicate between Provinces. I know of one case which is coming on in which neither of the Provinces concerned show any desire to have the Government of India interfering.

56,795. You know the history of these matters in Federal States, for instance. There comes a point when the interests of two States, or Provinces, are in collision, and someone has to decide. Universally, that is the function of the central body?—That will have to come about in the particular case to which I am referring, but it has not got to that stage yet. As things are now, however, the Provinces do not want the Inspector-General or anyone else interfering in their private affairs, as they say. They did not welcome the Inspector-General in my time, in the very least.

56,796. Is it your view, then, Sir Frederick, that there is no need at this moment for any authority to settle these matters?—There is every need. It ought to be done at once. The dispute to which I am referring ought never to have been allowed to get to the stage it has. Every day the Government of India postpone stepping in is going to make the matter more and more difficult to settle.

56,797. You think the Government of India should take active steps to appoint either an individual or a body capable of arbitrating, and of giving a decision in the matter. Is that your view?—Yes.

56,798. Do you think an individual, or a group of individuals acting as a Committee, is the most appropriate arrangement?—I should say an individual.

56,799. Have you anything to add to that, Sir Thomas?—(*Sir Thomas Ward*) The Inspector-General of Irrigation was extremely useful in preventing disputes, by helping the Provinces to clear up the technical side of the question. The way it was worked in the case of Bahawalpur was that the Government of India first had a meeting of the Governments under the Hon. Member, at which the technicians sat outside of the meeting; they were merely called in to give advice. That settled the administrative lines. Then the technical side was made over to the Inspector-General, who had conferences, discussions and so on with perhaps the same officials, but as Engineers. The Secretaries of Government watched the proceedings, sitting outside of the meeting. They knew what was going on. We acted on the idea, which is accepted in India, that if technicians can keep together and discuss things, they can settle them at friendly, round-table conferences.

56,800. *Sir Henry Lawrence*: What were the circumstances of the Bahawalpur dispute?—It was a dispute between the Punjab, Bikaner and Bahawalpur as to the allocation of the supply. It had been going on for years.

56,801. That was a matter between the Provincial Government and two Indian States?—Yes.

56,802. It was not on all fours with a dispute between two Provincial Governments?—Not quite. In the case of Madras the matter was referred to arbitration, with disastrous results. There the Inspector-General might have acted, but unfortunately they thought the matter would be settled quicker by arbitration. It was hoped to get through with it in about three months, whereas it took 10 years.

56,803. That again was a dispute between a Provincial Government and an Indian State?—Yes.

56,804. *Mr. Calvert*: What about the Jumna River between two Governments?—That is a remarkable case. The Jumna River is divided two-thirds to the Punjab and one-third to the United Provinces. The file is still only one of a few pages, and it has been going on now since the separation of the Delhi district from the United Provinces; that happened about 70 years ago. I have been on the Jumna several times during my service, and I do not now recollect any matter concerning the distribution of the supply ever going as far as the Superintending Engineer. I went down to Seistan in 1903 where there was a water dispute. An arrangement was made (in 1870) by a Royal Commission which went there, and that worked happily until the Russians came just before the war with Japan and stirred up strife for political reasons.

56,805. *Mr. Kamat*: The Madras dispute is now satisfactorily solved, is it not?—I do not know. (*Sir Frederick Gebbie*) I think it is.

Mr. Kamat: If it is satisfactorily solved, by what method was it solved?

56,806. *The Chairman*: In the event of some one officer being placed once again in the position of having to advise the Government of India in cases where the interests of two Provinces conflict, is there some danger that the fact that that officer must necessarily, one presumes, have done most of his service in one Province, would be likely to suggest to other Provinces that his views were biased and coloured?—Some Provinces have that idea, but I do not think it is the case. I have had to deal with several Inspectors-General and I never found them in any way biased.

56,807. I am not suggesting that the bias is there?—But certain Provinces have that idea.

56,808. So far as that holds, is that rather a point for a committee as against an individual appointment?—It might be, but I do not think it has any real existence in fact, because, after all, everyone knows that the final decision does not rest entirely with the Inspector-General. His Member may be a Member of the other Province!—(*Sir Thomas Ward*): The point is whether the people are at liberty to bargain or whether a ruling is required. If the interests concerned are free to bargain it is all right; they can settle it in that way, but if it is a matter of obtaining a ruling, then you have to have a very formal procedure.

56,809. But there comes a moment in these matters, as in many others, when a decision, even if it is not a perfect decision, is a blessing?—That is so. In the case I referred to at the commencement of my evidence, the question of how the water was to be divided was settled in formal conference, after which the technicalities were left to be bargained over.

56,810. The Commission has heard a good deal of evidence on the more technical questions of irrigation. I do not know whether there is anything in that field to which either of you gentlemen wish to refer, such as problems of research in relation to deterioration of land consequent upon irrigation, and matters of that sort?—(*Sir Frederick Gebbie*): That is more a matter for a soil physicist than an irrigation officer.

56,811. Did you form any view as to whether research in certain of these problems might be carried on on an all-India basis, or whether research would be better carried on Province by Province?—I think it is better carried on Province by Province, but the Government of India

ought to be in a position to obtain all the information which the Provinces have collected, and distribute it all over India.

56,812. You think there is a real danger that the Provinces may work in watertight compartments, and that the experience of one Province may not be made available to the other Provinces?—That is so. At present there are only two Provinces going in for research in purely irrigation matters, regarding flow of silt and things like that. The other Provinces do not take any interest in it, because I do not think they know anything about it.

56,813. Which two Provinces are those?—Punjab and Bombay.

56,814. What do you say about the current classification as between productive and non-productive schemes? Are you satisfied with that?—As far as I could see it was good enough. It served its purpose.

56,815. Do you think that, in that classification, sufficient account is taken of the indirect increase in revenue likely to result from the irrigation of a tract of land?—No, I do not think there is. That is a question which is occupying Bombay very seriously now.

56,816. So that, to that extent, you are not satisfied with the existing classification?—I thought you rather meant as regards the actual construction of the works. They ought to take the good of the whole country far more into consideration than they do, and not merely the good done to the particular tract. Also they do not take particular notice of the indirect advantages that come from it.

56,817. Is it the case that many schemes of irrigation in being to-day, and regarded as quite indispensable, would never have been constructed if the costs at the time when they were constructed had been equal to the present post-War costs?—That is so. They are many instances of that. The Lower Swat Canal would never have been constructed, and none of these protective schemes in Bombay would have been constructed, if cost had merely been taken into account.

56,818. *Sir Henry Lawrence*: Was the Lower Swat Canal constructed for political purposes?—No. It was constructed for famine protective work originally, and now it is one of the most paying works in India.

56,819. *The Chairman*: Does that suggest that the present rules governing the classification as between protective and non-protective schemes might well be examined with a view to their being amended?—To a certain extent, but I think the real thing is that no one can really foresee what is likely to happen. In the case of the Lower Swat, the main cause of its success was that it caused the tribe to settle down; they found it paid them better to cultivate than to go raiding. It was not originally constructed for that purpose; it was constructed originally as a famine protective work.

56,820. Were you satisfied with the degree of touch between the Irrigation and the Agricultural Departments in India? Is it sufficiently close?—It is in Bombay; in some cases perhaps too close.

56,821. What about the Punjab?—(*Sir Thomas Ward*): It depends, I think, upon the personality of the officers. On one occasion my colleague said, "This is a very serious business—all this friction." I said, "What friction? You and I are the best of friends." "Yes," he said, "I mean the friction down below." I replied, "There cannot possibly be any friction down below if there is no friction up above. It always starts at the top." It is a matter of the personality of the individual directors. A lot of the work must be done on the spot, in the fields with the farmers. It was suggested to me in my time that the Irrigation Department should have an agriculturist attached to it, but at that time it was not a practical proposition as there were not a sufficient number of trained men.

56,822. *Sir Henry Lawrence*: Do you consider, Sir Frederick, that the position of the Inspector-General, subsequently Consulting Engineer, was weakened after the new Government of India Act was introduced?—Yes. He had no reason to exist after the Reforms came in.

56,823. Why?—Because he had nothing to do.

56,824. Was he not able to obtain information from the provincial officers?—Very rarely; and only if he happened to be on good terms with the man from whom he was trying to get the information. If he did not know him he just got what the other man pleased to give him. I found it very difficult to get any information at all.

56,825. Had he no authority to demand information?—None. I could not go to a Province unless I was asked. I had to ask for permission to go.

56,826. Whose permission?—The Chief Engineer of the Province.

56,827. Could you not be authorised by the Irrigation Member of the Government of India to visit a Province and obtain information?—No.

56,828. Do you mean that he had not the power, or that he would not exercise the power?—I am afraid I never asked him. I understood that he could not do anything. If I wanted to go and see anything I had to ask the Chief Engineer if he had any objection to my doing so.

56,829. Would you turn to Section 45 (1) of the Government of India Act? It says, "Subject to the provisions of this Act and Rules made thereunder, every Local Government shall obey the Orders of the Governor-General in Council and keep him constantly and diligently informed of its proceedings, and of all matters which ought in its opinion to be reported to him, or as to which he requires information." Could not the Member of the Viceroy's Council give you authority to go and obtain what information you required under that Section of the Act?—Yes, it would appear so.

56,830. The necessary orders were not issued by the Government of India?—No. Possibly they did not want the information, or any information, when I was there. Even so, I think in connection with any order issued under this Section, if the man who had to comply with it was not willing, he would merely give the minimum amount of information.

56,831. No doubt, but what I suggest is that no alteration of the law is required to enable an officer of the Central Government to be authorised to obtain the information. If he does not get that information, that is a matter for subsequent negotiation between the Central Government and the Provincial Government?—That would appear to be so from this Section. (*Sir Thomas Ward*): In my time the Inspector-General was responsible; he was the final technical authority on projects when they came up. Therefore the Provinces were only too pleased to give him information. For any question outside the projects, the Provinces could ask for advice, if they wished. The Inspector-General had no responsibility to give advice unless it was asked for. A rule like the one just quoted was never discussed in my time.

56,832. The difference now is a financial one. The financial responsibility rests with the Province and not with the Imperial Government. Is that your point?—That is what I understand. I had no experience with the Reforms. My business was to finish up before the Reforms came in. Everyone knew what the right action was with reference to an irrigation project under the old regime, but no one knew what the correct procedure would be under the new.

56,833. Looking at the problem now, would you consider that it is the alteration of financial responsibility which weakens the control of the Central Government?—Yes.

56,834. But even now the rules provide that schemes over a certain size and cost must receive the approval of the Central Government and of the Secretary of State?—(*Sir Frederick Gebbie*): Yes, anything costing over 50 lakhs.

56,835. To perform that function, the Central Government must still maintain some technical control and technical advisers. Do not you think so, Sir Thomas?—(*Sir Thomas Ward*): I think so, yes.

56,836. At the present moment, there are being carried out schemes costing several crores of rupees. They are being carried out in the United Provinces, the Punjab and in Sind. Others are projected in Madras and Bombay. Is it not advisable that the Government of India should have some technical adviser with full authority to investigate the preliminary steps of those schemes and to study the course of their construction?—I think myself that that is very advisable, but it is very difficult to see how you are going to keep such a man in training in a slack period. He must have something to do. In my time, and up to my time, the Inspector-General of Irrigation was on the side of being an over-worked official with £60,000,000 worth of projects going backwards and forwards between Provinces. Naturally the Irrigation Department in all the Provinces then took a great interest in the Inspector-General. Nevertheless, it was very carefully impressed upon me that I must be extremely careful how I conducted myself when I was in the Provinces. I was told never to give an order or anything of that sort.

56,837. But you could obtain your information?—The Chief Engineers were only too glad to give it to me.

56,838. The point I want you to give your attention to now is whether you consider that that Section of the Act does empower the Government of India sufficiently to exercise vigilant supervision?—I think so. It seems quite a practicable rule that the Government of India should be kept informed, and should have power to obtain information as required. It is only necessary to make rules as to how the Order should be carried out.

56,839. Will you turn to item 7, Part II of Schedule I to Rule 3 of the Devolution Rules? You will see the subjects which have been devoluted to the Provinces. Amongst them are "Water supplies, irrigation and canals, drainage and embankments, water storage and water power; subject to legislation by the Indian Legislature with regard to matters of inter-provincial concern or affecting the relations of a Province with any other territory." Did that point come before you, Sir Frederick: that in order to deal with any question in dispute, this rule requires legislation by the Indian Legislature?—(*Sir Frederick Gebbie*): That is what I always understood.

56,840. Is that convenient?—No, I should not think so.

56,841. Do you think that control by the Governor-General in Council would be a better and more effective method than legislation by the Indian Legislature?—It would be much quicker, any way. Legislation might take years.

56,842. Which would be the more liable to error?—I should think the Legislature.

56,843. It is a point for consideration whether a dispute between two Provinces can be more effectively dealt with by legislation than by Executive Order of the Governor-General in Council under Section 45 of the Act?—Before the Reforms, any dispute between two Provinces was dealt with by the Governor-General in Council.

56,844. And no great disaster followed from that?—I have never heard of any.

56,845. *Sir Thomas Middleton*: When we were in Bombay our attention was drawn to the work of Mr. Lowsley, who has been appointed to consider the utilisation of small rivers and *nullahs* in connection with small

irrigation schemes. I do not know, Sir Frederick, whether you are aware of what Mr. Lowsley is doing now?—(*Sir Frederick Gebbie*): I talked to him several times about his work.

56,846. Do you think there is scope for similar work in other Provinces?—There might be scope for it in certain parts of Madras. I do not think it would be of the least use in the Punjab or Upper Provinces, because the conditions there are entirely different.

56,847. You think that there is no part of the United Provinces or of the Central Provinces where such work would be of value?—It might be in the Central Provinces. I do not know them sufficiently well to give an opinion about it. There might be parts of the Central Provinces where such work would be useful, but the only places I know of are those parts of Madras bordering on Bombay, that is to say, in the *Ghat* section of Madras.

56,848. Sir Henry Lawrence has pointed out that power exists, or appears to exist, by which an Inspector-General, if there were one, could get information. The question is, what sort of reception would the Inspector-General get at the present time if he went to a Province with a view of demanding information?—I should think, very bad.

56,849. He has no money at his disposal; he has nothing to offer except good advice, and you think good advice is not always acceptable?—Not unless it is asked for. (*Sir Thomas Ward*): I think even bad advice is good. It is a matter of criticism. Unless you have criticism you can never be certain where you are, but in India, unfortunately, people are very sensitive of criticism.

56,850. You point out that criticism in this country comes from altruistic institutions, by which I suppose you mean institutions like the Institution of Civil Engineers?—Yes. We also get it in the Press.

56,851. Is there anything in India which corresponds to the Institution of Civil Engineers in this country? Are there means of getting criticism in India in the same way as you get it here?—Yes. There is an Institution with local organisations.

56,852. Does that Institution meet in sections in the different Provinces?—(*Sir Frederick Gebbie*): They have periodical meetings. Last year the meeting was held in Bombay. This year it is to be held in Madras. Then they always have an Annual General Meeting in Calcutta, which is the headquarters of the Institution.

56,853. Is it an unofficial institution, or is it an official conference?—It corresponds to the Institution of Civil Engineers here.

56,854. Any engineer in practice can become a member if he has certain qualifications, can he?—Yes. (*Sir Thomas Ward*): It was formed under the ægis of the home Institutions.

56,855. Is it affiliated to the home Institution?—No. The first idea was to start a section of the home Institutions in India, but at a joint meeting of the home Institutions, which was called for the purpose, the conclusion was come to that as money would have to be raised, the authority must go with the money, and we were told that we would be much better advised to form our own Institution and run it on parallel lines with the home Institutions as far as possible. It is under the ægis of the home Institutions, and it is run on parallel lines; but it is entirely independent.

56,856. What number of people attend a meeting, if a technical paper is discussed? Is it a large gathering or quite a small meeting?—(*Sir Frederick Gebbie*): At the last Bombay meeting I do not know exactly how many attended the meeting, but there were over 200 at the dinner which followed, and I take it that most of those who attended the dinner were at the meeting. (*Sir Thomas Ward*): The Local Governments allow travelling expenses to the meeting, so it is now a rendezvous for engineers.

once a year. The Governor generally addresses them and they have a dinner, and a large series of papers are discussed.

56,857. Reference has been made to the possibility of the Inspector-General acting as an adjudicator; do you think there is room for the Inspector-General as a stimulator of work in the Provinces, if we could get over the difficulties to which you have referred?—(*Sir Frederick Gebbie*): I think so. I do not say that he should originate schemes of his own, but he might very well go round and get into touch with the local people, who would tell him what they would like to be done, and who could tell him their difficulties. He could help them to get over those difficulties. In the case of a project which the Chief Engineer would not think worth touching because of his difficulty in getting it through, the Inspector-General might assist him greatly.

56,858. I know nothing about the technical details of irrigation schemes. I have merely listened to the evidence which has been given in India, but the impression I gained was that the position of irrigation in the different Provinces is very unequal?—Yes, it is. In Bengal, for instance, it is a mistake entirely to call it an Irrigation Department. They have only two irrigation canals. Their whole time is spent in inland navigation.

56,859. Dredging?—Yes, just keeping the navigation channels open.

56,860. From that point of view, an officer of the Government of India might serve a very valuable function?—Yes.

56,861. *Dr. Hyder*: With regard to disputes between Provinciai Governments, two possibilities of settling those disputes were mentioned by the Chairman, one, by a decision to be made by an individual officer; and, two, by a decision made by a committee of individuals. In the case of the latter body, would you have something in the nature of a former tribunal with a preponderance of lawyers on it, and also people who know something about irrigation; in other words, a committee composed of practical men and lawyers?—That is what led to all the trouble in Madras and Mysore, having a tribunal of that nature.

56,862. How are these disputes settled in other countries in the world? Take the case of the Sudan and Egypt?—They did have a Commission there, but that was not so much to settle the question of water supply as to whether the Sudan was to have any water or not.

56,863. There are two things in my mind, firstly, disputes, and secondly, distribution in future. With regard to disputes, would you have the whole matter settled by an Inspector-General of Irrigation, or would you give the parties a chance of bringing their disputes before a Tribunal of Waters?—If you had an Inspector-General at the head as in the old days, it would probably never get to the point of a dispute. It would be settled before it became a real dispute. Do not you think so, Sir Thomas?—(*Sir Thomas Ward*): I think so. That is what usually happened.

56,864. With regard to the control of the Government of India in the past, was that control extended to matters like the sanctioning of schemes and the fixing of rates, or did it go beyond that?—(*Sir Frederick Gebbie*): What rates do you mean?

56,865. Charges for water?—The whole project had to go before the Government of India.

56,866. I am asking you this because there is some impression that the Government of India was very efficient in the past as regards forcing its will on the Provinces, but it appears to me that, in this matter of fixing the rates, they were not so very powerful. The rates remained fixed for long periods. The Government of India laid down certain principles, but those principles were not carried out in their entirety by the Provinces. Is that so?—That is a revenue matter, and I cannot say anything about that.

56,867. I am discussing the question of the operations of the Government

of India as regards control in irrigation matters, and it appears to me that in one particular matter, at any rate, the Provinces defied the Government of India, and the Reforms have created nothing new in this matter?—They could not defy the Government of India in irrigation matters, because if they did the Government of India would cut off supplies. The man who controls the purse is top dog.

56,868. Have you anything to say about the methods of distribution of water: how water should be distributed to the cultivators? Could the existing methods be improved upon, or do you think we had better leave matters where they are?—That is one of the things on which the Punjab and Bombay are experimenting now: the best system of distribution to the cultivators.

56,869. *Professor Gangulee*: They are experimenting on the volumetric method, are they not? Is that an economic method?—One cannot help thinking that people would make better use of water if they had to pay for what they actually used.

56,870. *Mr. Noyce*: One of the Chief Engineers in India who appeared before the Commission suggested an All-India Irrigation Congress. I think the idea was an annual meeting of Irrigation Engineers with a more or less permanent secretariat at Delhi. Have you any views on that?—What would they be supposed to do: merely to distribute information?

56,871. I think the idea was to discuss with each other what was happening?—That would be valuable in its way. It might be worth while considering holding it in the cold weather at some place where works were under construction.

56,872. Have you any views as to which department should carry out well irrigation? Supposing it was considered wise to start an intensive campaign for well sinking, should that be under the Irrigation Department or under the Agricultural Department?—Personally I should say it should be under the Agricultural Department.

56,873. For what reason?—Because it is a matter which is entirely outside of the ordinary Irrigation Engineer's duties.—(*Sir Thomas Ward*): I think well irrigation, in order to get a really fair start, should be put under a department like the Agricultural Department. It is or has not been a very big question in the Punjab.

56,874. Wells have disappeared from the irrigated tracts in the Punjab?—In the Punjab they have disappeared altogether in some tracts that I know of. Some of the tracts would have been very much better irrigated by wells, but as years have gone by wells, somehow or other, have disappeared in spite of orders to the contrary.

56,875. *Professor Gangulee*: On this question of co-ordination in matters relating to irrigation between the various Provinces in India, I notice that you say in your note of evidence: "This has hitherto been accomplished through the Inspector-General of Irrigation in India." I want to know what was the exact machinery through which this co-ordination was accomplished?—(*Sir Thomas Ward*): I am afraid this note is rather badly written. It had to be written in a hurry, but I think the fourth paragraph attempts to deal with that. It was done by personality more than anything else. The Inspector-General, after all, was a practical officer. He had to get projects reviewed in good time, and he did not want more information than was practicable. There was no kind of research work done by the Inspector-General of Irrigation. It was a practical appointment in every way. There is, behind the question, the idea of research; this is providing for posterity, whereas the individual engineer only provides for himself. That is the practical difficulty. Wherever I have been, the young engineers, whether in Brazil or the Argentine or India, say: "Cannot we have this worked up?" At meetings of the Institutions the same question often arises: "Cannot the

Institution tackle this?" One would have thought it would be a quite simple thing, but when I came to be a Chief Engineer myself and since discussing it with other Chief Engineers, the position seems to be that the Chief Engineer usually has brought up with him by personal research work all that is required for the work that he has to tackle, and he is brought there to get on with the job, as is said, and not to do research for future work. That, I think, as Sir Frederick Gebbie suggested, should be under a physicist, if possible, or some man who will devote his whole life to research alone. If you put an engineer on, so soon as he has found out what he himself wants to know he wishes to get on to the job.

56,876. Apart from the question of research on matters of irrigation in general, there is co-ordination?—That is so, getting an idea from one Province adopted in another, and that sort of thing.

56,877. When you suggested co-ordination in matters relating to irrigation, what had you in mind?—The same co-ordination that the Royal Commission on Agriculture had in mind in asking us the question; it was in the Secretary's letter and we had a long discussion over it. We should have to sit down and think out a definition; I think it is really in this note.

56,878. You referred to research problems. When you suggested co-ordination in matters relating to irrigation, I want to know what matters you were referring to; is it the engineering aspects or the agricultural aspects of irrigation, or both?—In a project arise questions of finance, revenue, agriculture, engineering and so on, but I understand the reference is really to engineering; that is our particular business.

56,879. Have you any suggestion with regard to the irrigation researches on such questions as the formation of alkali soils, waterlogging and so on? Could they be efficiently undertaken by the Central Government or by Provinces?—(*Sir Frederick Gebbie*): It is being done now by the Provinces to a certain extent.

56,880. Do you consider that problems such as the formation of alkali soils and waterlogging are problems of all-India importance?—They are of all-India importance, but I think they are better done by the Provinces concerned, because now, for example, in Madras, there is not much trouble with that, nor is there in the Central Provinces; but in the Punjab and in Sind that problem arises to a great extent. (*Sir Thomas Ward*): Even within the Province it is sometimes a purely local trouble. A matter of research of that kind is rather like medicine; you have got a disease; it would be no use studying that disease except at the actual point where it is manifested. In the Punjab, one man will tell you that the whole Punjab is becoming an alkali swamp if he happens to have been where it is a great trouble; another man will say there is no such trouble at all in the Punjab. The problem should be studied locally, I think.

56,881. The symptoms must be studied locally?—Yes.

56,882. But the fundamental problems of the question must be studied centrally?—That is the whole point with regard to research: whether each Province can afford to keep up a sufficiently capable staff to deal with a question of that sort. For instance, in the Punjab what was required was a physicist to work out this problem (in the War we got sanction, but, of course, the man could not be got). Had the work then been done, probably the physicist would have passed on to another Province, and so on, or he might have passed into the Government of India to work out these problems. I think that is a matter which would have to be gone into as the problems arise.

56,883. I think the Irrigation Commission recommended the adoption of the volumetric system of distribution; could you tell us what are really the difficulties in regard to the adoption of that system?—(*Sir Frederick Gebbie.*) One of the difficulties is that you have not got an efficient meter

to measure the volume of water. We have got, now, certain modules which are fairly accurate, but if you get one that is what is called a rigid module, which will, let us say, always distribute two cusecs whatever quantity of water comes down the distributary, then, if the water falls slightly, all the outlets at the head will continue to take two cusecs, with the result that the ones at the tail will not get any; on the other hand, if the water rises, those at the head will not take any more, and those at the tail will be flooded out. We want a rateable module which will not distribute a rigid two cusecs, but will distribute the water in the canal ratably. That means, of course, that a particular man will not always get his two cusecs; that is the difficulty.

56,884. Do you envisage any administrative difficulty?—I do not see any administrative difficulty, but you get all sorts of opinions about that. (*Sir Thomas Ward.*) We went into this in the Punjab, on the Shahkot distributary of the Lower Chenab Canal in 1915, and it was the opinion of the Financial Commissioner at that time that the revenue difficulties were much greater than the technical engineering difficulties.

56,885. Yes, that is what we are told?—Unfortunately, the modules were found defective and the experiment had to be postponed; but it was continued after I left, not perhaps in that particular place; what the result of the experiment was I do not know; perhaps they are still on it.

56,886. *Mr. Calvert*: You know, of course, the main details of Sir Ganga Ram's hydro-electric scheme in the Punjab, using canal fall power to lift water up for irrigation purposes?—(*Sir Frederick Gebbie.*) Yes.

56,887. Do you think there is much scope in other parts of India for similar schemes?—There might be in the Bombay Deccan, where you can get heavy fall in the canal bed without losing command and where they only irrigate on the down-stream side of the valley. In the Deccan they are all contour canals; they only irrigate on the down-stream side of the canal. But there, there is no more than enough water for the land which is commanded. It can be done in the Punjab, because there you get a fair fall in the bed of the canal. In Sind most canals have no falls at all, so that you have not got your fall available.

56,888. *Mr. Calvert*: Do you think the problem of drainage should be under the Irrigation Department?—It should be a part of the original project; the drainage system should be included in the original project of the canal. You ought not to wait till the waterlogging occurs and then start draining; you ought to try and stop waterlogging from the beginning.

56,889. We were told that Indian soils require far more drainage than they are at present receiving; it was said that drainage was a very important problem?—It is. (*Sir Thomas Ward.*) That is agricultural drainage?

56,890. Yes?—That would be under Agriculture I should think. It is, all the world over. Agricultural drainage is an art in itself; but our drainage is main drainage, surface water drainage.

56,891. Taking a specific problem in dispute between Provinces, as to whether the water taken out from the canals does or does not return to the river, what sort of machinery would you establish to settle a dispute of fact of that kind?—(*Sir Frederick Gebbie.*) A man made that statement in a certain Province; I told him he could keep all the water that came back and let us have the water in the river; but he would not listen to us when it was put in that way. He said quite enough came back for us, but when I offered it to him he would not have it.

56,892. There is a dispute as to actual fact which, apparently, is a bone of contention?—Yes.

56,893. What sort of machinery should be set up to solve the actual problem?—You would want gauge observations taken for many years to determine how much water comes back and how long it takes coming back.

Water does come back; you have only to look at those weirs at the lower canals in the Punjab, the Chenab and Jhelum, to see that. A river below a weir, say, in January is absolutely dry, while five or six miles below there is quite a big flow of water, which must be all seepage water.

56,894. But we are told that does not apply to the river lower down in Sind?—They have got now, I think it must be, nearly twenty years' observations there, and, instead of having an increase of supply at Sukkur, there is generally a diminution of twenty-five per cent. between the volume measured at the junction of the Panchnad and the Indus at Mithankot and what passes Sukkur. Twenty-five per cent. less passes Sukkur than comes in there at the junction of the Panchnad and the Indus; there is a loss of water between the Punjab and Sukkur of twenty-five per cent.

56,895. Speaking generally, would you say that the progress of irrigation in India is satisfactory?—I think so.

56,896. *Mr. Kamat*: It has been alleged in certain quarters that, compared to the Punjab, the Irrigation Department in Bombay has not utilised the rivers in the Bombay Presidency to the fullest extent for the benefit of the cultivator; what is your view?—I take it when you say the Bombay Presidency, you really mean Sind?

56,897. I mean the Bombay Presidency proper, excluding Sind?—In the Bombay Presidency proper, they have made far more use of the rivers than the Punjab has, because the Punjab has no storage projects at all, while the Bombay Presidency has many.

56,898. So that you think there is no truth in the statement that the Bombay Presidency Irrigation Department is not giving its fullest assistance from its natural sources to the cultivator in that respect?—Of course I will not agree to that; I am a Bombay man myself.

56,899. With reference to this alleged lack of touch between the Irrigation Department and the Agricultural Department, I believe one of you gentlemen replied that it was all a question of personality?—(*Sir Thomas Ward.*) Yes, I did.

56,900. I want to know, instead of leaving such matters of friction to personality for the moment, whether you can suggest any system by which any possible friction between the Irrigation Department and the Agricultural Department could be solved, say, by some such machinery as a common Board or a joint committee or something like that?—I think in the Punjab they have a board; I am not sure; there was not in my time; we worked by what I have called personality or round table conferences; but I think later on a more or less formal board was established.

56,901. You know, disputes often arise between the Agricultural Department and the Irrigation Department as to how much water is required for sugarcane per acre, or as to the sizes of different bunds, and so on, for the distribution of water to fields. You know that the outlook of the Irrigation Department or of the staff of the Irrigation Department is entirely for revenue, whether under the productive or unproductive canals, as you call them, wheeas the outlook of the Minister of Agriculture is entirely different. That being the position, can you suggest a method by which the ryot can have justice from both these departments, without depending on the personnel or the personality for the time being?—(*Sir Frederick Gebbie.*) You might put agriculture and irrigation under the same Member.

56,902. That is exactly what I was coming to. From your own point of view you see no difficulty, constitutionally speaking, in placing agriculture and irrigation under the same Minister?—I believe there is, because agriculture is transferred and irrigation is reserved; but I take it that will not be so for ever.

56,903. We will not discuss whether it will be for ever or for a short time; we will look at it, so far as your irrigation officers are concerned,

only from the point of view of the administration of the two departments and for the greatest benefit of the cultivator. You think it would be better from his point of view that they should be under the same man?—Possibly from the cultivator's point of view, yes.

56,904. And from the administrative point of view there would be no difficulty?—I do not think so.

56,905. On the other hand, we are told that irrigation schemes would suffer if they go into the hands of a Minister; you would not agree with that statement?—Suffer in what way?

56,906. Suffer from the point of view of efficiency or finance and so on?—I do not see how they would suffer from the point of view of efficiency.

56,907. They would not?—I do not think so, not if you had a Chief Engineer who knew his business.

56,908. From the point of view of efficiency in irrigation, there would be no difference whatever you think if they were under the control of the same Member who administers agriculture?—I never found that the Member in charge of the Public Works Department had very great effect on the efficiency of the internal administration of the department. (*Sir Thomas Ward*): Of course, we had not a Member in the Punjab; the Chief Engineer was himself on the Council. I do not think my experience is the same as that in Bombay and Madras.

56,909. But in principle would you think it an anomaly or not?—I should like to say a word on one of your assumptions which have so far passed for granted: that the Canal Department are obviously out for higher water rates. I once had occasion to read every file on water rates (they all go up to the Government of India, they are all there; you have only to pull them out of the records). It was about a fortnight's reading, and in most cases it was the Chief Engineer, i.e., the Canal Department, who made the difficulties about raising the rates, beginning with the Ganges Canal, right up to my time.

56,910. That means his outlook was only for revenue; that supports my statement?—No, for keeping to the low rates. The suggestion to raise the rates usually came from the Revenue Departmnt; the difficulty lay in persuading the Chief Engineer to go in for a higher rate. The Chief Engineer was liable to be obsessed with the technical difficulty of running water in an irrigation work if the farmers were not taking the supply.

56,911. But, in any case, beyond the question of the total collection of revenue, they never looked at it from a broader point of view?—I do not say they never looked at it from a broader point of view; I say it appeared in these files that the Chief Engineer felt this difficulty, that if you raised the rates so that the demand, as it is called, fell off, there was the technical difficulty of working the canal satisfactorily.

56,912. Then would you agree that this question has to be looked at not only from this point of view, but from a larger point of view, namely, the improvement of general agriculture: not merely as to the limitations of your rates and how they affect your productive or unproductive schemes of irrigation?—I do not think you can expect the Chief Engineer to look at the water rates from the point of view of what effect higher rates may have on agriculture, although in that same reading I noticed that it was pointed out, not only by Chief Engineers but by Revenue Officers, that higher water rates made for better cultivation, more especially in the Bombay Deccan.

56,913. You mean, the higher the rates the better the agriculture?—Yes; I suppose because the weak men were squeezed out.

56,914. *Sir Henry Lawrence*: Provided the water is taken?—I think the idea was that the rates were so low that any sort of agriculture could pay the rate; if the rate was very high a farmer would have to be a very good farmer or he could not make it pay. The Chief Engineer has to look

at the question purely from the canal point of view; it is the business of the Agricultural Department to look at it from the point of view of agriculture. If they think the canals ought to earn more money than they do, so that they may get an allotment from them, it is their business to point this out of course, and thus you obtain criticism and discussion and are able to arrive at a decision more or less just to the actual cultivator.

56,915. *Mr. Calvert*: Is it your opinion, as I gather from answers given to various questions, that the Irrigation Department should confine itself to irrigation from canals? You told Mr. Noyce you did not want to take on wells and water lifts, and you said you did not want to take on drainage, and Sir Thomas Ward referred to it just now as a Canal Department. Is it your idea that the Irrigation Department should be exclusively a Canal Department?

Mr. Noyce: You would include large tanks I suppose?

Mr. Calvert: Yes.—(*Sir Thomas Ward*): My experience is that the Irrigation Department in India (when we talk about the Irrigation Department with a great big capital "I") is a very specialised department in the Punjab, the United Provinces and Bombay. Attempts have now and then been made to make over small works, as in the case of the Gurgaon works which were once in the Irrigation Department, but it was found more satisfactory to put them under the district.

56,916. They have gone back to the department?—Perhaps they will go back again to the district in a few years. It just depends what the work is.

56,917. We are faced with this question of water lifts, the further utilisation of the subsoil water; that is a highly technical matter?—All through my time in the Punjab, the tendency of the department was not to undertake any class of work that could be more efficiently organised in some department working directly under the Deputy Commissioner.

56,918. That is to say, you would prefer to have a separate department rather than attach it to the Irrigation Department?—I would be inclined to go into it; I am quite certain, if such a question had been put before me as Chief Engineer, I would have looked at it in that way to see whether it could not be run by some department likely to be more in touch with it. That is in the Punjab, of course; I do not know the other Provinces, where it may be quite different.

56,919. *Sir Thomas Middleton*: The canal engineers are essentially civil engineers in our sense?—Yes.

56,920. Whereas the question of water lift is a mechanical engineer's problem?—Yes, there is a great deal of mechanical engineering in that. In the Punjab, water lifting from tube wells was done by our mechanical engineers. There were two mechanical engineers who took a great interest in it, and in fact it could not have been made the success it has but for their great mechanical talent.

56,921. *Sir Henry Lawrence*: Your mechanical engineers were members of the Public Works Department and under the Chief Civil Engineer?—Yes, he controlled them.

56,922. *Sir Thomas Middleton*: Sir Frederick Gebbie, I think you mentioned that volumetric distribution was theoretically desirable?—(*Sir Frederick Gebbie*): I said that was my opinion, but I know lots of people differ from me.

56,923. Does it not resolve itself into this: Water can only be provided by volume for an area of a certain size; you must have, say, four or five thousand acres as a working unit; could you possibly deliver in small quantities for, say, ten acres by volume?—The experiment they made in Bombay was on about 1,500 acres, and usually in the Bombay Presidency and the Punjab it does not much exceed 2,500 acres; you never have more than that on one outlet.

56,924. You could deliver volumetrically to a co-operative society of villagers, for example?—That is one of the difficulties, as to getting payment.

56,925. It is the practical difficulty of distributing to separate individuals that prevents adoption of the volumetric basis of supply?—Yes, you would have to distribute it to the village; you could not do much to each individual cultivator.

(The witnesses withdrew.)

Mr. G. F. KEATINGE, C.I.E., I.C.S. (Retd.).

NOTE OF EVIDENCE.

1. My personal knowledge of India is now six years out of date, and I propose to confine myself to a few fundamental points in which, I believe, no material change has occurred since I left India.

2. While serving in the Bombay Presidency I had opportunities of observing the economic condition of the peasants and forming an opinion as to the fundamental causes of their poverty. The outstanding feature of rural India is the over-population, resulting in excessive pressure on the soil. Analogous to this is the position of the cattle, the number of which is greater than the normal fodder supply can maintain. In either case the facts are obvious. The remedies also are obvious, but not such as would commend themselves to Hindu sentiment.

3. Arising out of over-population, but greatly aggravated by law and custom, there occurs a distribution of land amongst the cultivating classes which is most prejudicial to production. The problems involved are generally referred to as the problem of subdivision and fragmentation of holdings. The facts are, doubtless, well known to the Commission. I would merely call attention to the fact that in the case of a small and fragmented holding, uneconomic in size and shape, having no permanence or stability, effective cultivation is not to be expected, permanent improvement is impossible, and production is, of necessity, very low. Perhaps the worst effect is to be seen in the helpless and indifferent attitude which it produces in the cultivator himself. In many tracts the number of these uneconomic holdings is large and is increasing. The position is as though a large number of the farm hands in England were trying to live on the produce of their allotments, which are intended (and, in fact, serve) merely to supplement the resources which they derive from their wages. It is this hopelessly uneconomic situation which prevents men of capital and enterprise from taking to agriculture, which discourages owners of agricultural land from carrying out improvements, and which deters middle-class youths from studying or taking up agriculture. At present, it is very difficult to find a farm of suitable size and distribution, and it is impossible to keep one in such condition. I can recall tracts in the Deccan where the rare holdings which happened to have a suitable size and shape stood out from the surrounding ineffective cultivation like bright stars. Ten years later they have probably been split up and reduced to the level of the surrounding average. I also remember an outstanding example at Utarsanda in Gujarat.

4. The remedy that I would suggest for this state of affairs is legislation permitting the creation of economic holdings which would be permanent and impartible, but subject to transfer by sale, gift or bequest. The creation of such holdings might be facilitated whenever suitable occasion occurred, e.g. when irrigation schemes are introduced and land values

enhanced by the creation of water rights, or when Government is asked to intervene to save a family from financial ruin. Encouragement might also be afforded by giving the owners of such holdings a priority of claim to *taccavi* or help from the Agricultural Department. A fund allocated to this purpose would do much to assist matters.

5. On economic holdings production may be doubled under ordinary circumstances, and where the creation of an irrigation well is possible it may be multiplied five or 10 times. I am not suggesting farming on a large scale as opposed to farming on a small scale, nor am I suggesting anything like uniformity in the size of holdings. On the contrary my experience in other tropical countries has impressed on me the value of extreme diversity in the size of holdings, ranging from production on a large plantation scale down to the tiny peasant holding.

6. In some localities the depredations of wild animals are very detrimental to agriculture. By far the worst offenders are wild pigs. It is not merely a question of the crops that they destroy, though this is very large, but of the crops which the cultivators are deterred from planting by the knowledge that they will inevitably be destroyed by pigs. In large tracts of the Southern Maratha country, cultivation is seriously prejudiced by this, and areas which should be a garden are a waste. In view of the pressure of the population on the soil in India, the position is very remarkable. Wild pigs are to be found in the cultivated parts of South Africa and South America, but are kept within reasonable bounds by the sparse population. In India it is otherwise. The reasons are:—

(1) To a small extent the religious sentiment of some classes.

(2) Apathy on the part of cultivators.

(3) The fact that the cultivators have not got effective weapons.

The remedy for the pig nuisance is to destroy the pigs. This presents much difficulty to the individual cultivator, but not to organised effort. No doubt the destruction of pigs is more difficult in the vicinity of large forests, and I am aware that pigs will travel long distances at night, but I have no hesitation in saying that it would be perfectly easy to reduce the number of pigs very greatly in the vicinity of forests, and to eradicate them altogether in selected tracts.

In particular, I may mention the monstrous case of the canal tracts of the Deccan where large droves of wild pigs live in the sugarcane, doing immense damage, year in and year out.

7. Some ten years ago, the Bombay Agricultural Department undertook the destruction of pigs on a small scale in some localities, in the absence of any other agency to undertake the work, and met with considerable success. The work was done on a very limited scale, since the department had not got the requisite staff or funds to undertake it on a large scale. I do not know how far the work has progressed since that time, but I may mention that it is not economical to employ trained agriculturists on such work, to the detriment of their legitimate duties.

8. When considering concrete proposals to assist Indian agriculture it is difficult to suggest anything that does not present social, political or special difficulties. Here, however, is a matter which, so far as I am aware, presents no such difficulties or disadvantages. It is a simple job, perfectly easy to do, and would be welcomed by almost the whole population of the tracts concerned, except in Gujarat and some other parts where there are Jains. The cost involved would return a hundredfold in the shape of enhanced crops. The extraordinary thing is that it has never been done before.

Oral Evidence.

56,926. *The Chairman*: Mr. G. F. Keatinge, you are a retired Member of the Indian Civil Service, and you were, for some time Director of Agriculture in the Presidency of Bombay?—Yes.

56,927. What were the dates of your service there?—I joined the service in 1894 and I left in 1921; for the last thirteen years I was Director of Agriculture in the Bombay Presidency; that would be from 1907 to 1921.

56,928. You were good enough a year ago to provide us with a note on the size, distribution and equipment of the agricultural holdings in Western India, and I think most of us have had the advantage of reading two of your books: "Agricultural Progress in Western India" and "Rural Economy in the Bombay Deccan." You have also been good enough to provide us with a note of evidence for to-day. I do not know whether you would like at this stage to make any statement?—No, I do not think so.

56,929. Have you any suggestion to meet the problem of dry cultivation in the Deccan? Do you regard that as one of the most pressing and, at the same time, one of the most difficult problems before the Agricultural Department in Bombay?—It is, undoubtedly; the lack of rainfall and the variability of the rainfall is certainly, especially in the East Deccan, the greatest difficulty; it is the limiting factor, the lack of water in many seasons.

56,930. Do you think there is any hope that a method of tillage might be discovered and popularised which would have the effect of conserving what moisture is available?—They already know a great deal about it, the best cultivators do; it is merely a question of degree; there is nothing entirely new to suggest. The so-called "dry farming" methods are not entirely suitable to heavy black soils, the cost involved is so great. The places I have seen where they do it most successfully in the United States are places where there are very peculiar conditions; in Utah and Idaho, for instance, the soil is such that there are very few like it in the world; it is extremely deep, very uniform, holds the water very well, and has great capillary powers of lifting the water. They certainly make a very great success of it there; but even there, the success they make of it is done by alternate fallows, which would be hardly suitable to a country where the population presses so heavily as in India, and also they do get an average of thirteen or fourteen inches of rain in a year, and there are certain climatic conditions, namely, the melting of the snows in the spring, which do facilitate this work very considerably.

56,931. Is the system of alternate fallows in that country an essential part of the scheme?—Certainly; you store up practically the whole of one year's rainfall, keep it and use it in the next year.

56,932. You use two year's rainfall in one year's cropping?—Yes; that is hardly applicable to a country where there is such a large population on the soil; but even that is done to a great extent in the Broach District where they have alternate strips of cotton; it is practically the same system.

56,933. *Professor Gangulee*: But the Americans also have the method known as subsoil packing?—Yes, they do; they have many things; but that is not the main operation to which the farmers trust; it is simply deep ploughing and keeping the moisture in with a good mulch; that is what the ordinary farmer in Utah and Idaho trusts to.

56,934. *The Chairman*: Is it your view then that very little can be done for the cultivators on these precarious tracts in the Deccan?—I do not think more can be done in this direction than to get the bad cultivators to adopt the practices now followed by the best.

56,935. You think the best cultivator knows all there is to be known?—I think he knows his own soils very well.

56,936. As to varieties of crops: do you think the Agricultural Department has devoted a fair share of its attention to the problems of the dry area in the Deccan?—No, I think on the whole we probably did not. It is a very slow process. In the first instance we looked for places where results were more easily obtainable. We did try this system of dry farming, and the great trouble was not only the shortness of the rainfall, but the extreme variability. I remember once in the Ahmednagar District we had a dry farming plot; we ploughed it very deep and got it into the most marvellous state of tilth, at quite an absurd expenditure; then I think we got about twenty inches of rain in about a month, and the result was that we could not get on to the land for a very long time afterwards. It is not only the lightness of the rainfall, but its extraordinary variability; we were much worse off than the people who had not got their land like that, because we could not get on to it.

56,937. I think you left behind you a Bill framed on permissive lines in order to enable cultivators to constitute their holdings as permanent and impartible units?—Yes.

56,938. Have you followed the history of that Bill?—I understood at the time I left that it was dead for the moment; the Government of India refused to allow it to be introduced; that is the last I heard of it.

56,939. Had you had time before you left to gather the trend of public opinion on the Bill?—I think the Bombay Legislative Council was, on the whole, quite favourably disposed to it; certainly a great many cultivators were. Cultivators all over the Presidency expressed their opinion that so long as it was permissive, they would warmly support it; but many people I spoke to were certainly actively opposed to anything like compulsion.

56,940. The difficulty is, I suppose, to bring into line on any permissive basis all the various co-owners and persons who have interest in the land? —Yes.

56,941. According to your Bill they all have to come into line voluntarily, have they not?—Yes. I think it could be done in a great many cases.

56,942. You think they would have come in?—In a great many cases. In every case, of course, of self-acquired land; the purchaser is the complete owner in the case of self-acquired land. Similarly, many cases occur when a family is in distress, and if anybody comes along with the money "on the table," they will agree to almost anything rather than go under, and there are many intelligent cultivators who would fully realise the advantages of it, who have enough land to divide up amongst their family after creating one or more impartible economic holding.

56,943. Are you familiar with the terms of the measure now projected in the Bombay Presidency?—No, I am not.

56,944. *Sir James MacKenna*: Are you in a position to speak about the changed position that has arisen, by reason of the introduction of the Reforms, with reference to central research and matters of that kind?—No, I am not.

56,945. You would rather not express an opinion? You left, I think, before the Reforms were introduced?—They had just been introduced but I left within a few months. I am afraid I have no special theory on the subject.

56,946. *Professor Gangulee*: On this question of excessive pressure on the soil which you referred to, have you any suggestion as to how that could be relieved?—It is due, of course, to the excessive population of India. I suppose in the long run nothing but some scheme for reducing the population, such as birth control, would make a clean job of it; but in the interval there are various palliatives; emigration would be one.

56,947. *Dr. Hyder*: Where to?—To the whole of South America except the Argentine.

56,948. *Professor Gangulee*: Is there any scope for subsidiary industries? —For cultivators do you mean?

56,949. Yes?—I often heard it talked about but I could never hear of anything which struck me as being practicable. Livestock is a farmer's subsidiary industry, and unfortunately that does not apply in India to anything like the same extent as it does in meat-eating countries.

56,950. You say that your experience in other tropical countries has impressed you with the value of extreme diversity in the sizes of holdings. What is this value you have in mind?—The value of this diversity is that there is a great diversity of capacity and desire amongst farmers and would-be farmers, and you must have a great diversity of means to enable them to carry out their practice of farming; for instance, in a country like India, which is practically all small holders, a large number of cultivators are not fit to run any business, even the tiniest holding, themselves; I mean except something which is merely an allotment. Lots of men who would make quite good labourers for, we will say, a plantation company or for a big farmer, are really too indifferent, too listless or possibly too lazy to work for themselves; but if they can find work with a big man they will very often do quite well. Secondly, it is a very educative thing to have a big company or big progressive farmer working in a tract.

56,951. During the time you were in the Bombay Presidency as Director of Agriculture, what was the relation between the Irrigation Department and the Agricultural Department?—I should say, extremely friendly.

56,952. There was no hitch?—Not the least that I am aware of.

56,953. Did you carry out any experiment jointly?—Yes, certainly. I am not sure whether I can think of any one where the actual management was technically joint, but we used to work together. They had a farm on the Mulla-Mutha Canal which we used to go and look at and give them all the advice and assistance we could, and we carried out some experiments on the Nira Canal with which they helped us.

56,954. These experiments were planned by the departments conjointly? —Yes, I think so; we certainly talked it over.

56,955. Have you any views on the matter of the Veterinary Department being under the Director of Agriculture?—I do not know why necessarily they should be under the Agricultural Department; but they ought to be closely allied under some head. I do not think it much matters whether you call a man Director of Agriculture and put him over three or four things, or whether you have a Minister of Agriculture and let him combine them; it is a matter of convenience, I think.

56,956. Should they be combined under one department?—I would not object to them being combined in the least.

56,957. Would you place veterinary under the Agricultural Department? —It depends whether you have a technical head; if you have a technical head of any department, there is always difficulty in combining with him people who regard themselves as rather outside his scope; but if it is a non-technical head, I think they certainly might be combined in one group.

56,958. Do you think there is any scope for the development of the dairy industry in the Presidency?—There is certainly a great demand for milk and dairy products; and therefore I should say there must be a scope for developing it; but it is a very difficult thing to do; it is a very difficult thing to recommend anybody to put private capital into it.

56,959. *Mr. Calvert*: You have just spoken of a demand for dairy produce; demand means demand at a price, does it not?—Yes.

56,960. Do you mean to say there is such a demand for dairy products in Bombay as to lead to an import of dairy products from other Provinces? —Dairy products would mean *ghi*?

56,961. Yes?—I mean, you cannot import milk; that is the trouble with regard to dairy products such as milk in India, that you cannot move them long distances without better facilities for cold storage; but as to *ghi* I should think there is probably an import. I am afraid I cannot say off-hand, but I should think there is probably an import from Central India.

56,962. But is not it really a demand at a low price?—Everybody wants it at as low a price as possible, but I should think there is probably a demand for quite costly dairy products in cities like Bombay, and possibly Poona.

56,963. If there were, in Bombay, a demand for *ghi* at a price higher than that prevailing at Lahore and Lucknow, naturally the *ghi* at present being consumed in Lahore and Lucknow would go to Bombay?—I cannot say; so many products of Indian manufacture are slightly different: the taste is slightly different, and the question of taste is of great importance. That is certainly so with regard to food grains. I am afraid I do not know sufficient about the fashion in *ghi*. The cost of carriage would not be very much in the case of *ghi*, but I cannot speak with accuracy. Presumably if *ghi* were very cheap in Lahore and very dear in Bombay, it would go to some extent to Bombay, unless there was something in its taste and quality which the Bombay people did not like.

56,964. It is really a demand within a very limited range of prices?—I think dairy products used to command a very high price in Bombay. At the time I remember, the price in Bombay of good dairy products was at least as high as it is in London, or higher, I should think.

56,965. Looking back on the time you have been in India, would you say that the Deccan villager has improved in material prosperity?—Yes.

56,966. Will you say exactly in what way?—I would say that he seems to be able to resist famine far better than he could when I first went out; I am now thinking of the 1899-1900 famine. I would say he wears far more clothes; the statistics show that he buys a good deal more hardware, articles of comfort and petty luxury. He certainly appeared to me, except in times of famine, to be somewhat better off. I would not say there was anything that you could point to which is very marked.

56,967. Would that be due, do you think, to the higher prices which he is getting for so much of his produce as he sells?—Very largely.

56,968. Do you think there is much scope for improvement on similar lines? Can you look only to higher prices for further material improvement?—No, I think you can look to other things. The main thing to look for I think, is to get more produce out of the land; you can only do that in my opinion by liberating the productive energy of the people which now to a very large extent is running to waste.

56,969. Do you mean, finding scope to employ more time on the land?—Yes, and more energy: putting more heart into them. The condition of a very large part of the cultivators is such that you cannot expect them to put their backs into it.

56,970. Putting further energy into the land is again limited by the rainfall?—Oh, no, by having a decent-sized farm, by having a holding that you can develop and work properly; that is the main thing that is wanted.

56,971. You come up then against the question of the displaced population?—I do not think you would displace any population; on the contrary, well-tilled and well-cultivated land requires more people to do it than the present quarter- and half-tilled land. You would certainly have less nominal owners, but not less population on the land; on the contrary, there would be a greater demand for labour.

56,972. You think you could still employ the same population on the land if you had your economic holdings?—Certainly.

56,973. But the majority then would be labourers?—A large number would be, yes. As it is, I should think the majority of them are labourers to some extent when they can get work, which is very seldom.

56,974. If you enacted that holdings should not be divided below a certain limit, do you think such a law would have the slightest effect on the actual number of people working on the land?—You mean all holdings?

56,975. Yes?—It would be a very difficult thing; that is not a law that I would suggest. It might have some effect; I cannot say; but it would be impossible to enforce a law of that sort, I think; it would be inoperative.

56,976. Do you think there would be any use in enacting that partitions reducing the holding below a certain limit should be ignored by the revenue authorities?—That would be absolutely useless; in fact it would be pernicious; it would simply be trying to live in a fool's paradise, pretending that partition was not going on. We did that originally in the Bombay Presidency, and the result was that in a short time our records bore no resemblance to the facts, and we had to go in for a completely new system of records.

56,977. Supposing you had an attempt to introduce something on the lines of primogeniture, do you think in actual practice the younger sons would leave the land or would remain on it?—I think they would have to remain on the land; there would be nowhere else for them to go.

56,978. There is practically no way out of the present subdivision of holdings by inheritance amongst sons?—I have suggested that what I consider to be the way out is the permissive creation of impartible holdings in cases where the people wish to do so.

56,979. But your impartible holding accepted by the owner of to-day would not necessarily remain impartible by his grand-children?—It would on the proposals I made: it would remain for ever impartible.

56,980. In fact as well as in theory?—Yes, I think so certainly. They might arrange to partition off amongst themselves, but it would not be recognised by law. I think it would remain.

56,981. *Mr. Noyce*: If they did partition among themselves, would not you be back to the old stage in which the records would not coincide with the facts?—No, because under the system I spoke of the Revenue Department did not recognise the partition, but the Civil Courts did, so that the people had civil rights in the partitions. According to my proposal the people would have no civil rights in them and anybody who claimed the right could be ejected except the one registered holder of the impartible holding who could show his title deeds. His title deed would simply show that it was acquired by inheritance, by purchase or by deed of gift.

56,982. *Mr. Calvert*: You know, of course, that an attempt at the impartible holding has been tried in the Punjab colonies?—I have seen it stated.

56,983. In actual practice you get younger sons, in spite of this impartible holding, living on the land as partners and ultimately claiming a share?—I do not know on what principle they work: whether these impartible holdings were merely to be created and then the ordinary Hindu law of inheritance was allowed to operate; if that was so, I should regard it as a waste of time to attempt it, because it simply means the whole thing would start splitting up again immediately, and in another generation all the good which had been done at some trouble and expense would be undone. If that was the case I should regard it as useless.

56,984. Did you ever, in the course of your economic investigations, try to ascertain whether in fact this fresh sub-division of holdings is really going on to any appreciable extent?—Oh, yes, it is to a very great extent. Sometimes, of course, the pieces come together again, but that is the general tendency. An instance was given by Dr. Mann in a paper he wrote on a village about eight or ten miles outside Poona in which he gave the actual number of holdings and of separately-owned plots in the

village. He got them for about a hundred years. For the last twenty years the increase in the number of separately-owned plots had been very great.

56,985. That is to say, the actual number of cultivators per cultivated area is increasing?—Yes, of cultivator owners.

56,986. *Mr. Kamat*: On this point of over-population, are there any tracts in India where the density is less and where people could be migrated to from territories where the density is greater?—If you consider simply the density per square mile, it would not give you a good figure to go on, because in some places the cultivated land and the fertility of the land is much less. In the Deccan it would probably only work out at two or three hundred to the square mile, which does not seem, compared with other parts of India, a very large amount; but still, the density there is considerable with reference to the productive capacity of the land, the rainfall and the amount of cultivable land. There is no part of the Deccan that wants filling up that I know of. There are parts of the Southern Maratha country which are malarious and suffer from wild animals, where the density of population is small.

56,987. Have you made any observations from census figures that the agricultural classes are multiplying fast, or whether this multiplication is only confined to the middle classes of the population?—I know from census figures that the town population is going up faster than the country population; but whether that means middle or lower classes I really cannot tell you. There is no such division, I think, made in the census figures.

56,988. It means that the evil of over-population you speak of is not so acute, then, in the case of the agricultural people as in the case of the town people, taking the census figures?—You say the pressure on means of subsistence is greater amongst the middle-class people? It may be so; I do not know. If, however, the suggestion is that the agricultural population has almost reached its limits, and that we may assume that it is unlikely to increase much more, I am not able to accept the suggestion. It is true that over a large part of India the rural population has in recent years been close to saturation point, and has been unable to increase materially. This must not be regarded as a permanent phenomenon. Saturation point is not a fixed one, but a constantly shifting one, with advances in security, communications, irrigation and administrative organisation, the saturation point of population for India has moved during the past century from (say) 200 millions to 320 millions, and the actual numbers of the population have rapidly followed the advance of the saturation point, thereby neutralising many of the economic advantages that were anticipated from the progress made. The pace has necessarily slowed down after the rapid progress made in the initial stages, when advance was made on the most obvious and accessible lines; but it is certain that the limit has not yet been reached. Scientific and administrative effort has still much to do. If we suppose that by such means the agricultural produce of India can be doubled, the result would be to shift the saturation point of population for India to (say) 600 millions; and there is no reason to suppose that the actual population of India would not move hard on the heels of the retreating saturation point.

56,989. In your time, with regard to the consolidation of holdings, did you try consolidation under the co-operative methods?—No.

56,990. It was not tried then?—I do not think that consolidation is any use without some change in the law which will make it permanent. Permanence was one of the things I thought was most important. Therefore I did not think it was worth while attempting any consolidation unless you had some guarantee of permanence.

56,991. Which under the co-operative system could not be achieved?—No, not without a change of the law. Also, I think it is rather straining

the co-operative system to get them to undertake a thing of that sort at this stage in India; I think there is other work which is much more suitable for them and much less difficult.

56,992. With regard to the Deccan, you think all methods of better farming, better implements, better seed and all that, would be of very little avail as long as the holdings are as small as they are at the moment?—No, certainly not; but it would be mainly on the holdings which happen to be economic holdings that these improvements could be introduced.

56,993. Any advice as to better farming or better means of farming to other holdings would be simply a counsel of perfection?—Yes, to many of the existing holders.

56,994. Since you left the Bombay Presidency, I believe public opinion has advanced and that your legacy of a Bill has now been taken up by a Hindu ex-Minister, who is now a Member of the Executive Council in the Bombay Presidency, to find out how far Hindu sentiment would like to have the principle of compulsion accepted so far as consolidation is concerned. Have you seen that Bill?—No, I have not.

56,995. The point there is that a certain element of compulsion is introduced for creating an economic holding if, say, three-quarters or two-thirds of the owners of the holdings in a village agree; that is just the first stage of compulsion. Would you agree that that is the right way to proceed?—I am very much afraid that any element of compulsion will defeat its own objects by raising opposition.

56,996. That is why this Hindu Member is trying to take his courage in his hands and make a trial how far the new reformed Legislature would go with him?—I quite see the point of it, but I cannot understand why they should not commence on a permissive scheme and assist it in every way.

56,997. Simply because it is feared that the permissive way would be a dead letter?—I do not think it would be a dead letter; I think it could be made to go by a certain fund being put aside and certain people being interested in it. At any rate, if it were a dead letter, it would do no harm; I think you would get quite a number of holdings in, and having once got them in you would never let them out; they would go on dribbling in by degrees and in time there would be many.

56,998. With regard to dry farming: another recent development in the Bombay Presidency is the appointment of a special officer to see whether intensive farming could be done, particularly along rivers or small sources of water. Do you think, from your experience of the United States, that even that kind of dry farming would be a failure?—It really depends entirely on the soil. In a great part of the Deccan, at any rate, the soil is thin, there is no depth of soil, and you have it lying on *murrum* and a very pervious well-drained subsoil. You cannot store water up. Where you have a very deep and heavy soil you can do it no doubt, but these Deccan soils are such that it is very difficult to get this fine mulch, and in many places the people never plough them. Some of the soils, as far as I know, have never been ploughed for a hundred years.

56,999. I gather from your remarks in the first stage of your evidence that you are rather pessimistic about the American method of dry farming, on account of the nature of the soil?—There is nothing special about the American method except that they boom it. I think the Indian cultivator has been doing all that they talk about, probably several thousands of years ago.

57,000. As we know, in certain parts of the Deccan he knows the advantage of putting up *bunds* or *tals* and conserving water?—The wheat cultivator every year does it; as the rain falls in the monsoon he preserves the water until the end of the monsoon, when he sows his wheat crop.

and will often get a very good crop without a single drop of rain having fallen between seed time and harvest.

57,001. If, then, in Bombay, we are seeking anything new from so-called American methods of dry farming, are we hunting an imaginary hare?—Yes, certainly. I should like to make it clear, however, that I think that in certain special tracts of the U.S.A. the agricultural authorities deserve great credit for the way in which they systematized good methods of cultivation and introduced them amongst farmers who were previously ignorant of them. No doubt there are parts of India where much work of the same kind can be done with advantage.

57,002. *Sir Henry Lawrence*: You have seen emigrants from India in various parts of the world I believe?—Yes.

57,003. Are the conditions in which they live any better than the conditions in which men of the same class live in India?—In some parts, certainly.

57,004. Which parts?—The part I think of chiefly is the one I saw most: British Guiana and Trinidad: they are extremely well-to-do.

57,005. Is there free emigration to those parts now?—No, there is no emigration.

57,006. What is the obstacle which is preventing it?—Speaking now of British Guiana, the people there made a very liberal offer. I was asked to investigate it; I went out and strongly recommended that it should be taken.

57,007. You were asked by whom?—By the Government of India. I strongly recommended that there was an enormous opening for emigration into not only that part of America but surrounding tracts.

57,008. Brazil?—Yes, Brazil, certainly. The Japanese are making great use of that opportunity.

57,009. Are they welcomed by the Government of Brazil?—Yes, they are welcomed.

57,010. And well treated?—Excellently treated. You will find on the biggest coffee plantations in Sao Paolo they have their cinema, dancing hall, electric light in their houses, water laid on. The labour scarcity is so great there that labour rules the roost in those tracts. As regards British Guiana, the Government there made a very good offer which would have afforded excellent opportunities for emigrants from India; but an attempt was made to get a much better offer. My experience is that there is no good trying to get a one-sided bargain in this world; nothing comes of it. The Government of British Guiana then said: "We want the men very badly; if you must have better terms, we will offer them." They offered all sorts of terms that they really could not carry out; they were too difficult and too costly; I think they were absurd terms. This was accepted and emigration was opened again to British Guiana. But I told them at the time it was no good asking for too much; you cannot get a one-sided bargain to go through. It simply lapsed; nobody is going there at all.

57,011. Is there room in those countries for emigrants by the thousand or the hundred thousand, or what?—By the million.

57,012. Do you think it would be of very great advantage to the people of India if some negotiations could be brought to a successful conclusion to enable these emigrants to go from India to South America?—I certainly think so.

57,013. Do you include Chili and Peru?—I am afraid I have no experience of Chili and Peru. I can talk about British Guiana. The West Indian Islands welcomed them; Venezuela was taking all it could get from British Guiana. I found there were no Indians going to Brazil; down in the South of Brazil, where there are excellent facilities, where it is very

civilized and there are enormous masses of land going, there was not an Indian in the place that I saw, but the Japanese were pouring over by the shipload.

57,014. Are there any specific steps which you would suggest should now be taken to open this form of emigration?—Yes, I should let them go to British Guiana straight away on the original terms offered and not stickle for impossibilities. I think the terms they asked for, and to which finally the Government of British Guiana agreed, were something to the effect that the Colony was to pay the cost of the passage over; when the people arrived there they were to be looked after and given clothes; then they were to be given a piece of land, they were to be financed to carry out the cultivation, and then, after five years, if they wished it, they were to be given a free passage home. No Colony could do such a thing, and after they had agreed to it they saw it was rubbish, they could not afford to do anything of the kind, and so the thing has remained. They badly want the Indians; enormous opportunities await the latter there, but nothing has happened because they asked for too much.

57,015. Is there opposition in India from the land-owning interest to the loss of sources of cheap labour?—Not in the parts that I know; I do not think so. In the parts I know they are mostly small men; I do not think they would mind at all; I think people would be glad to get rid of a lot of them, say, in the congested tracts of the Deccan. In Gujarat there might be some big landowners who would object; I cannot say; but I do not think there would be any appreciable opposition in the Bombay Presidency.

57,016. The trouble arises out of some form of political sentiment, does it?—I do not know what it arises out of. It is trying to get too much. I do not know what they object to over there; the people are very well treated. I have made a report to the Government of India about it. Some of the people go to the wall badly over there. There is a very sharp break in customs and in life between what they are accustomed to in India and over there. The capable ones go up very quickly, but the condition of the incapables and unfortunates is very bad; they have no one to fall back upon when they go under and they go under very badly; but, after all, that is not a large proportion.

57,017. Can that be dealt with by any Government machinery by appointing a protecter of immigrants?—Yes, it can be.

57,018. I think you have dealt with the question of sugarcane cultivation in the Deccan?—Yes.

57,019. Sugarcane cultivation is of great importance to the finance of the Deccan canals?—Yes.

57,020. It is the main stay of some canals?—Yes.

57,021. Do you find that sugarcane cultivation increases in area when the price of *gur* goes up?—Yes, certainly.

57,022. It varies according to the price of *gur*?—Mainly, yes; it is like every other crop: if prices go up the people all want to plant sugarcane. In the War, when prices were very high, there was an enormous rush to plant sugarcane.

57,023. Does the price of *gur* become affected by the price of refined sugar coming into Bombay?—Yes, certainly; it works in close relation to it; it does not vary entirely with it.

57,024. The increase of importation would have a tendency to decrease the price of *gur*?—Certainly.

57,025. There are some people who sometimes eat *gur* and sometimes eat refined sugar?—Yes.

57,026. And they shift from one to the other according to the price of one or the other?—Yes, to a certain extent; quite enough to make all the difference in the price of *gur*.

57,027. And enough to affect the desire of a cultivator to grow cane?—Yes.

57,028. It is an important matter for the general prosperity of the cultivator in the Deccan and for his protection against famine that cane cultivation should be encouraged?—I do not know how it would protect him; to some extent it would protect him against famine. That is a more doubtful point. I think it certainly is desirable that sugarcane cultivation shall be encouraged, provided that it is good cultivation.

57,029. Does that cane cultivation provide employment for surrounding villages when there is no crop on their land?—Yes.

57,030. To that extent does it protect them against famine?—Yes, it does.

57,031. *Sir Thomas Middleton*: North Gujerat, which was formerly considered to be free from risk of famine, is now a precarious tract?—Yes.

57,032. Difficulties arose, I think, during the time you were in India. When you were in the Agricultural Department was any consideration given to the possibility of increasing the storage of monsoon water in that area by bunding *nullahs*, or by the formation of *bunds*?—The Agricultural Department did not consider it, certainly; but in the famine time many of the existing tanks were improved and the guiding walls for the water were lengthened and so forth.

57,033. That was done as a famine relief work?—Yes. There was a Famine Commission. It was exhaustively discussed then. The Famine Commission did discuss it for Northern Gujerat, but I do not remember, except as a famine relief work, anything material being done in Northern Gujerat.

57,034. Have you yourself any views on the possibility of retaining a larger proportion of the monsoon water than the soils do naturally?—My general feeling is that it is only worth constructing tanks in the *ghat* area where you get a very heavy rainfall always. My experience of some of the tanks in the East Deccan was that, in the years of drought, they had no water in them. If you have a reservoir in the *ghats* where there is normally about three hundred inches of rainfall, even if the rainfall goes down to two hundrd inches, there is plenty of water in the tank; it always fills; but in East Deccan many of our tanks did not fill in drought years. The same would be the case and is the case in Northern Gujerat. I have seen the tanks empty in a year of drought.

57,035. They are very shallow tanks?—Yes, but I have seen them practically empty and the rice crop being spoiled for want of water.

57,036. But no attempt has been made, I think, to *bund* any of the smaller rivers?—No, not that I know of; I do not know about that.

57,037. I think there was a project in the Ahmedabad District some years ago; I do not know whether it has been carried out or not?—I do not know of anything.

The Sabar Mati scheme. Has this project been carried out or not?

Sir Henry Lawrence: No.

57,038. *Sir Thomas Middleton*: You have not much hope in co-operation as a means of dealing with fragmentation of holdings?—No, I have not.

57,039 Are you aware of the fact that in the Punjab, in the last year or two, about 60,000 acres have been dealt with by co-operation?—In the Year Book of India just published I have seen it stated.

57,040. It has been taken up, I think, by about 250 villages?—Yes, those would be irrigated villages, I take it, canal villages?

57,041. No, they were well-irrigated villages or unirrigated?—It apparently has possibilities, but if the law is not altered it is merely temporary; these holdings will at once be split up again.

57,042. That is assuming the population increases steadily, which in that area it has not done?—But in any case, though one family may have no children at all, another family will have five or six, even if the general population is not increasing, and then that holding will be split up into five or six.

57,043. *Mr. Calvert*: We are discussing fragmentation, not sub-division? —Fragmentation is a matter of custom of course. Possibly co-operative effort among the intelligent people may do something for that. It is a thing for the people to do as a body. I am thinking of the ordinary co-operative society which, I must say, I prefer to regard more as a business organisation, and this strikes me as being a thing outside ordinary business which I never regarded as essentially work for a co-operative society such as we knew them.

57,044. *Sir Thomas Middleton*: Now to come to sub-division: in thinking over that subject in connection with your Bill, had you in mind the possibility that there were any districts where it could be used for prevention, although it might be impracticable as a cure?—Yes.

57,045. There are such districts?—Yes, certainly: East Deccan especially. Sub-division has not gone very far, as yet, in the East Deccan.

57,046. The figure you gave us just now of 300 persons to the square mile would mean something like an average holding of ten acres?—Yes. You cannot judge by that, because half of that area might be rocky hill unfit for cultivation at all. That is the trouble about the Deccan figures. It always looks on paper as though the Deccan were not highly populated, but in point of fact we have so many rocky hills there that if you take the actual area of cultivable land it is highly populated.

57,047. But, taking the Bombay Presidency as you know it, would you say there is scope for an Act, even if it accomplished prevention only and did not cure?—Yes, there is.

57,048. You mentioned emigrants to British Guiana. From what parts of India would they chiefly come?—From the congested districts of Bihar and Orissa and Madras and a few from all over the country, but those were the two main tracts.

57,049. In the past ten or fifteen years, the Departments of Agriculture in India have very much increased in size; I would like you, if you feel able to do so, to give me your view as to the relative advantages of a civilian and a technical Director of Agriculture?—I may say, in my case I combined the two.

57,050. I know you did, that is why I ask you?—It was a pretty full job for a man without his dabbling much in any technical business. It is chiefly a matter of terminology whether you call him Director of Agriculture; there must be somebody who will co-ordinate the functions of the departments dealing with the interests of the cultivator from different points of view. It may be the Director of Agriculture or you may put it to a Minister of Agriculture.

57,051. But if you shift direction further up, and rely on a temporary Minister, will you get equal efficiency?—It is more remote; he has not the opportunity of going about and seeing things on the spot in the way the Director has.

57,052. *Mr. Noyce*: We have heard a good deal about co-ordination at the top; is there any possibility of co-ordination at the bottom? One of the complaints which was made to us in India was that the ordinary cultivator has to go to far too many departments to obtain advice and assistance; he has to go to the Agricultural Department, the Veterinary Department, the Co-operative Department, and so on. Is there any possibility, in your view, of combining the work of the three from the point of view of the villager?—I think there might be, not from the point of view of the investigator but of the oridinary man who brings technical matters to the knowledge of the cultivator. The difficulty, in my experience, was, very often, that a man would come round to show the cultivators one thing, we will say, how to pickle seed against smut, or something of that sort; he had this one thing to show them and one thing only. I think he should have been a more all-round man, something like the old inspectors under the

Congested Districts Board in Ireland were, who would go round and be prepared to give the cultivator advice about anything. If you could get the right class of men, that type would be very useful; he would be able to advise the cultivator about everything.

57,053. How are we to get hold of that type of man?—It is a difficult type to get hold of; these men in Ireland were mostly Scotsmen.

57,054. You cannot contribute to the solution of the problem?—No; I do think there was a tendency often for too many people to go round, each doing one small job. A lot of our men used to say they had to travel a long way, and when they got to the end of the journey there was very little to do. Of course, these are many different things, and one man very often has not the technical knowledge to deal with all these things; but it is the thing to aim at if you could get the right type of man.

57,055. What were the objections raised by the Government of India to the introduction of your Bill?—They refused permission; I do not think I ever saw their letter refusing permission, but they did. It is the same objection that gets in the way of everything in India: the economic considerations always have to give way to political ones.

57,056. *Professor Gangulee*: Have you any views on the Loni type of agricultural school?—It was experimental in my time; it created a lot of interest; but we did not find it easy to get people to send their sons there, beyond a few men who were really progressive, a few of the village *patel* class. But though they had their education, board and lodging and everything free, we had to go round hat in hand to implore people to send their sons there. I do not know how it has turned out.

57,057. *The Chairman*: Do you regard accurate economic surveys of a village or of the individual cultivators' holding as the essential foundation of policy?—You mean a survey of small units?

57,058. Yes?—I do not know that they are any better than a much more general survey. I have always doubted it myself.

57,059. You think false conclusions are likely to be gathered from such surveys?—I think so. I do not think you can get the certainty. Personally I have always thought you could get a more correct view by a general survey on a much larger scale, provided it was done carefully.

(The witness withdrew.)

Mr. V. A. GRANTHAM, of Messrs. Forbes Forbes Campbell & Co., Limited.

NOTE OF EVIDENCE.

My experience is confined almost entirely to the cotton industry, and I should be happy to answer any questions arising out of my connection with the Indian Central Cotton Committee, The East India Cotton Association, Ltd., or my firm, Messrs. Forbes, Forbes, Campbell & Co., Ltd., which has for many years dealt in Indian cotton.

My views on the agricultural development in India generally, and its co-ordination and the part the State should play in this co-ordination, are contained in a speech delivered by me at a Meeting of the Associated Chambers of India and Ceylon, held in Calcutta on the 14th and 15th December, 1925, a copy of which is attached hereto. (Appendix I.) As regards cotton specifically, the following points appear to me to require special attention.

Apart from the main questions of how to increase the quantity grown, consideration must be given to the possibilities of disposing of the surplus crop and to the question of the improvement of the quality of the existing crop. As regards the former, the Indian Central Cotton Committee has

taken steps, from time to time, to ascertain the average overseas demand for cotton of different staples, and it would appear that there is a fairly consistent market for a certain proportion of short staple, but that over production of short staple must react on the price paid for the Indian crop as a whole. The findings of the Board that has recently examined the Bombay Mill Industry indicate that increased production by the Indian Mills is more likely to be successful if yarns of higher counts are spun, the corollary being that the Indian Mills are likely to require more staple cotton. It would appear, therefore, not only that it is desirable to improve the growth of the existing crop, but also that any increase in the growth of the crop would best be confined as far as possible to staple cotton.

As regards the price paid for Indian cotton, it should be borne in mind that, while the price of Indian cotton is influenced almost completely by world prices, that is to say mainly by American prices, the parity between "Indians" and "Americans" is variable, and the marketing of the surplus of the Indian crop must depend almost entirely on that parity. Continental and Japanese mills can, to a considerable extent, substitute "Americans" for "Indians" and vice-versa, according to existing price levels, and Indian staple cotton, in particular, is only saleable in large quantities at competitive prices. In this connection, it should be noted that there is still no useful hedge contract in Liverpool for Indian cotton, and, inasmuch as a large portion of the European cotton business is transacted on the basis of American prices, either on call or fixed, exporters of Indian cotton are at a distinct disadvantage as compared with exporters of American cotton. The Liverpool Empire Futures Contract is not likely to be of use to Indian exporters unless considerable modifications are made in it.

The next point to be considered is the possibility of improving the quality of the Indian cotton crop. One of the prime reasons for the creation of the Indian Central Cotton Committee was in order to improve the quality of cotton grown in India, and under this heading may be considered:—

1. Improvements in picking.
2. Improvements in staple.

Obviously, any improvements made in these directions are not likely to be maintained unless the financial benefit derived can be secured for the grower of the cotton. In short, the grower cannot be expected to play his part unless it pays him to do so. The grower's position may be materially improved by increased outturn, consequent upon research work, as also by a wholesale improvement in the staple of a complete area, but he will not obtain a full compensating price unless he can afford to sell his produce in his own time, and unless he has favourable channels through which to market his cotton.

As regards finance, recent inquiries by the Indian Central Cotton Committee tend to show that the question of finance is not the paramount one that it has always been considered to be. In short, a fair percentage of cultivators can afford to sell their cotton in their own time.

As regards markets, I consider that without open cotton markets, on the committees of which the grower has an effective voice, it is impossible to ensure him a square deal. An open market, with rules properly administered, should ensure fair weighments and fair prices, and, broadly speaking, I do not think it can be said that the cultivator obtains either at present. He is to a great extent uneducated and is liable to exploitation by buyers of all classes. The absence of markets, moreover, usually means an absence of godowns and storage spaces, which may compel a grower who has carted his *kapas* to market to sell at a poor price rather than cart it back to his village. Absence of markets, on the other hand,

does not seriously incommode the buyer, and very often directly benefits him, as it may be accompanied by absence of competition.

The next step, after marketing, is ginning and pressing, but as the grower very largely sells his produce in the form of *kapas*, he is not responsible for the results of bad ginning, although bad ginning may have repercussions on the price paid for cotton in his area.

The cotton, when ginned and pressed, is either exported or sent to a mill or sent to one or other of the terminal markets for sale, Bombay being by far the largest terminal market. Here the rules of trading are administered by the East India Cotton Association, Ltd., and, during the past few years, numerous reforms have been carried out.

A recent innovation, viz., the introduction of "on" allowances up to two classes above the basic grade is a direct incentive towards the production of cleaner and better cotton, and this incentive must influence the price paid by exporters and millowners and should, in consequence, bring about better picking The chief problem is how to ensure that the grower gets the full benefit resulting from the production of good cotton, and the question is complicated by the almost invariable custom of selling ungraded *kapas*. As long as this system obtains, it is difficult to see how the grower can be protected, unless a particular market produces better cotton as a whole. One particular grower producing good cotton in a centre producing otherwise poor cotton is unquestionably handicapped, and his only hope is the help of co-operative sale societies.

I doubt the practicability of growers attempting to gin their own cotton, in view of the fact that the quantities handled by each grower are so small, and the fact that small ginneries are usually badly run. Moreover, it suits exporters best to buy *kapas* and grade their cotton themselves according to the types which they have established in the overseas markets, and they prefer to buy *kapas* because it is easier to select cotton in the form of *kapas* than in the form of lint, which may be mixed.

The main features that militate against the ultimate success of Indian cotton are:—

1. Excessive leaf, &c
2. Bad ginning.
3. Mixing.

As regards No. 1, improvements can only be carried out by the grower, and will only be carried out if he can be convinced that they will pay him.

As regards No. 2, the remedy lies with the factory owners, and the difficulties with which the average buyer has to contend in this direction are innumerable. Bad ginning means the presence of oil, seed and cut seed in the lint.

As regards 3, much has been achieved by the Cotton Transport Act, but the problems of mixing in areas where different staples are grown in adjoining fields is a far more difficult one.

In my opinion, mixing by growers and middle-men has only been resorted to on a large scale in places where poor staple has been imported into areas where good staple is grown, and this problem, which has to a large extent been solved by the Cotton Transport Act, certainly has the effect of very quickly depreciating the value of the cotton grown in the area where the mixing takes place, owing to the fact that buyers never know exactly what they are getting and cannot risk paying a full price for their purchases.

Mixing by exporters for specific export types, which is carried on in areas where good staple is grown in fields adjoining those where poor staple is grown, has not the same immediate effect, as it does not cause exporters to pay lower prices for all classes of cotton grown within the area, but

it probably eventually reacts on prices, as a false impression may be created in overseas markets as to what cotton is grown in India. In both cases, of course, there is the risk of mixed seed percolating into the fields for the next sowing, and thus deteriorating the crop. On the other hand, the mixing would appear to facilitate the sale of cotton when the parity is against India.

It has been suggested that the practice might be stopped if exporters could be persuaded to discard private types and to sell on the trade descriptions recognised by the agricultural departments, but this suggestion, I think, is impracticable. Quite apart from the fact that private types clearly safeguard the interests of the exporter, the step would be a retrograde one equivalent to a narrowing of contracts, and I think it will be generally admitted that, the broader the contracts, the more stable prices are likely to be. In my opinion, it is important to discourage the use of station names, such as was in vogue some years ago and to promote the sale of cotton on its merits. The suggestion, moreover, would be impossible to enforce, and it is probable that good shippers would be penalised to the advantage of bad shippers if they attempted to carry it out. Then again, when a mixed type is sold, the overseas buyer knows what he is getting so that no question of fraud is involved. The larger exporters are not likely to risk losing a reputation built up over a period of years, by shipping cotton inferior to type, and it should be remembered that these shippers do now sell on pure as well as on mixed types. Finally, exporters cannot be expected to sell only on pure types, as long as a large quantity of mixed cotton is sent by middle-men and ginners to the terminal markets for sale, which may be sold for export in direct competition with them. The records of ownerships obtained through the Ginning and Pressing Factories Act really only cope with false packing and cotton tendered under one of the Bombay hedge contracts. It does not, and cannot, touch cotton deliberately mixed for export purposes and shipped direct, as long as that cotton is equal to type.

If it is held that the practice is one that should be stopped, the only remedy would appear to me to be the licensing of gins and presses and the declaring of the mixing of different growths in ginneries to be illegal, and a practical example of how this would work is to be seen in Rajpipla State. I can see no other remedy that would be both effective and immediate in its effect.

The system of hedge contracts in Bombay is still, to my mind, defective, as the contracts are not sufficiently interlinked to prevent wide price fluctuations. Unnatural fluctuations must be inimical to the interests of the grower, who should be able, as far as possible, to be sure of marketing his produce at prices stable in relation to world prices. The interlinking of contracts could be achieved, I think, without unduly broadening them and without the risk of price depression.

As this question is one of great importance, I have attached hereto an extract from my presidential address to the Sydenham College Students' Cotton Association on the 16th January, 1926. This extract sets out the various points clearly. (Appendix II.)

The channels for marketing cotton overseas are very highly organised and may safely be left in the hands of the exporters whose prime interest it is to sell as much cotton as possible.

Information as to market conditions, both in India and overseas is, I think, amply available to merchants and traders, but the grower, of course, is not in such a favourable position. The utmost that could be done in this direction, in my opinion, is to publish Bombay hedge contract prices in the up-country markets where they are not already available, as they

would serve as some guide to the trend of prices. Any attempt to give further information would, I feel sure, lead to confusion.

Properly constituted market committees might, however, take steps to compare local prices with those of neighbouring markets.

The available crop statistics and forecasts are, in my opinion, not as accurate as they should be as regards yield. The introduction of rail-borne statistics and the system of collecting pressing figures, now in force under the Ginning and Pressing Factories Act, should help to effect improvement but complete improvement cannot be achieved without more extensive crop-cutting experiments and the presence in the districts of trained statisticians.

APPENDIX I.

SPEECH DELIVERED AT A MEETING OF THE ASSOCIATED CHAMBERS OF INDIA AND CEYLON, DECEMBER 1925.

Mr. President and Gentlemen,—The resolution I wish to move on the subject of agriculture reads:—

> "That this Association, recognising that the prosperity of trade and industry in India depends to an overwhelming degree upon the purchasing power of the people, and that such purchasing power cannot be increased materially except by the development of agricultural productivity in India, welcomes the decision of the Government of India to co-ordinate the activities of agricultural development in the various Provinces."

In moving this resolution, I am impressed with a sense of my own temerity in endeavouring to deal adequately with so important a subject and one which embraces so many interests in the short time at my disposal, and I realise only too well the impossibility of doing full justice to it.

In the first place, let me say how much we, in Bombay, welcome the pronouncements made by the Secretary of State and His Excellency the Viceroy after the latter's recent visit to England. These pronouncements indicate that the Government of India propose to co-ordinate the activities of agricultural development in the various Provinces, and it is with this decision that I wish to deal to-day.

I propose to open my remarks with the saying of a wise man called Markham some 300 years ago. He wrote:—

> "A husbandman is the master of the earth, turning barrenness into fruitfulness, whereby all commonwealths are maintained and upheld. His labour giveth liberty to all vocations, arts, and trades to follow their several functions with peace and industry. What can we say in this world is profitable where husbandry is wanting, it being the nerve and the sinew which holdeth together all the joints of a monarchy."

These words in themselves explain my resolution, for agriculture in India is by far our most important industry and, apart from the wealth it brings to the State, it provides three out of every four people in India with a means of livelihood. What wonder then that we should say that the prosperity of India cannot be increased materially except by the development of agricultural productivity, and taking the matter a step further, is it not equally true that unless the purchasing power of the people of India, which to an overwhelming degree means the agricultural population, is substantially increased, modern methods of manufacture in this country, with or without the artificial stimulus of tariffs, will rapidly reach their limit of expansion? It follows then that all of us, whether our primary interest is to sell goods to India or to sell India's crops, or

to manufacture goods in India, must be vitally concerned with the progress and development of agriculture in this country, and that we should leave no stone unturned to attract brains, enterprise and capital to it.

That takes us a step further along the road, for if brains and enterprise and capital are to be attracted, it follows that the State must take steps to co-ordinate the various activities of agricultural development and must realise its responsibilities for the provision of means for agricultural research, for the agriculturist cannot be expected to work out his own salvation on empirical lines. India is an illiterate country, and agriculture presents a large number of highly specialised problems which can only be solved by highly trained specialists, research being the foundation of all progress in this as in other industries.

Much, of course, has already been accomplished by the small staff of research workers of the Imperial and Provincial Departments of Agriculture, and India owes much to this small and loyal band of men. But we have now to examine the future of agriculture in the light of the Reforms and consider how the full driving and organising power of the State, which is so necessary to agriculture, can be obtained under the present system.

It must be remembered that agricultural problems do not coincide with administrative boundaries, many of them being common to large tracts, and their proper solution may be necessary to the welfare of the country as a whole. The need, therefore, for co-ordination will at once be obvious. Co-ordination is frequently associated with centralised control, but clearly this is not the form of co-ordination which is necessary. What is needed is some organisation promoting free co-operation between those engaged on identical or allied work.

So far as cotton is concerned, there is such an organisation in the Indian Central Cotton Committee, on which all connected with cotton, whether from the commercial, industrial, agricultural or scientific point of view, are represented, and this committee is in the unique position of possessing funds of its own for the promotion of research. But it is at once apparent that there are comparatively few crops to which this particular form of organisation is applicable. Cotton is unique in that there are no less than seven cotton-growing Provinces and several very important cotton-growing Indian States, while the cotton mill industry is of the first magnitude as is the export trade in cotton. Jute is, to some extent, a parallel, except that it is largely the monopoly of two Provinces. Sugarcane is manufactured in the country, but factory methods only apply to a relatively small portion of the whole, while there is no export trade.

But, though it is probably not possible to provide parallels to the Central Cotton Committee to deal with other crops to the extent of possessing independent funds for the promotion of research, one side of that organisation might be copied with advantage in connection with general agricultural problems, for the outstanding success of the Central Cotton Committee has been due to the sustained effort in which the commercial community, the grower and the agricultural departments have all taken part, and to the mutual trust that has accompanied that effort. Consequently the problems which they have tackled have been properly examined from every point of view and, when a recommendation has been put forward to Government, it has included a practical and generally acceptable working scheme.

India is an important exporter of wheat, oil, seeds, fibres, &c., and when the improvement of an export crop is being dealt with there would seem to be every advantage in enabling the Agricultural Department and the commercial community to discuss matters together. Whatever organisation

may be decided on for the co-ordination of agricultural effort, this is a point which should be kept constantly in view.

Another very important function which such an organisation as has been foreshadowed could perform, is the spreading of agricultural knowledge amongst the educated classes as to what agricultural improvements have been introduced and what they mean to the country, and in particular the Agricultural Departments want the backing of the Legislatures. The burden of this duty cannot be placed entirely on provincial agricultural departments, for when it is realised that they not only have to undertake research, experimental and development work, but also act as seedsmen and occasionally as dealers in implements and manures, and have, moreover, to organise village demonstrations and publish simple vernacular pamphlets, it will be realised that they have little time for general propaganda, and yet such propaganda is always necessary, for without it the strong public opinion which is so necessary if adequate funds are to be provided for agricultural departments is likely to be lacking.

The problem which faces the agricultural investigator is not so much how agricultural research can assist Indian agriculture as which of a number of pressing problems should be taken up first, for the amount spent in India up to date on agricultural research and experiment is quite insignificant compared with the enormous value of the interests involved, and the amount of work waiting to be done is out of all proportion to the funds provided or the number of workers, and it must be remembered that this statement applies not only to local problems, but to a number of fundamental problems.

It is well to remember in this connection that only a small percentage of the scientific agricultural work carried out in other countries is directly applicable to India, a point best illustrated by reminding you that in temperate countries the bulk of the rainfall occurs during the growing period of the crop, whereas as far as the cold weather crops of Northern India are concerned the rainfall occurs almost entirely outside the growing period, thus establishing a fundamentally different set of conditions.

It follows that, with so much work waiting to be done, the most rigid economy of funds and effort is called for and, as agricultural crops do not observe provincial boundaries, there is good reason to think that more rapid results might be attained if the basis of our organisation were the crop rather than the Province.

If agriculture in India is to develop then as the needs of the country require, it is imperative that the Government of India should realise its responsibilities for the provision of means for agricultural research. Central research is, specifically, one of its responsibilities under the Government of India Act, and I personally regret the tendency shown till recently to treat such matters as agriculture and irrigation as purely provincial subjects. India is moving, I think, towards some form of federal government, and it so happens that the country with the most highly developed form of federal government, to wit, the United States of America, is also the country which has devoted most money to, and achieved the biggest results in, the improvement of agriculture by scientific means. It is most significant that, despite the independence of the various states, each of which possesses its own Agricultural Department, the Federal Government in America has found it necessary to maintain the strongest Department of Agriculture in the world.

In India we have had several marked instances of work at central stations producing results applicable to a large area, such as Mr. Howard's work

on wheat at Pusa, that of the central sugarcane station at Coimbatore and the building up of a valuable pedigree herd at Pusa, while it is satisfactory to be able to record that the Government of India has recently adopted a definite policy in connection with cattle and dairying in connection with the All-India institute at Bangalore. This work shows what can be done by central effort, but it must be borne in mind that much of it was done before the era of the Reforms, and that the Central Government has not at present an Agricultural Department either large enough or sufficiently endowed with funds to function as it should do. Research work in connection with fundamental problems, propaganda, educational work, the co-ordination of provincial effort and promotion of schemes for the general advancement of agriculture in India would appear to be the special responsibility of the Central Government, and we must bear in mind that a system which makes it difficult for the various agricultural departments to keep in touch with each others' efforts and to benefit from their failures and successes, and which tends to make each Province follow its own policy and go its own way, is fraught with danger.

Another direction in which the help of the Government of India is required is in the initiation of measures to introduce improved and standardised designs of agricultural machinery. The development of agriculture in India must depend to a large extent on efficient machinery and the cultivators, who are numerous and poor and have no natural leaders, rely on Government for guidance in this matter. Moreover, mechanical engineering and its application to agriculture, as Sir Alfred Chatterton rightly pointed out in an able article in the "Asiatic Review" this year, presents a field open to immediate exploitation; this is a matter which will not be without interest to the commercial world, but it should also attract the serious attention of young Indians of a mechanical turn of mind; for India is not rich in the numbers of her indigenous engineers, and here, surely, is full scope for those who wish to earn a living and the gratitude of their country.

The only remedy would appear to be a strong central organisation backed by the Central Government with funds and workers, which would supply the organisation and the driving power necessary to co-ordinate and develop the working of the industry as a whole, and I therefore commend my resolution to the Meeting in full confidence that it will meet with your approval.

APPENDIX II.

Extracts from Presidential Address to the Sydenham College Students Cotton Association, January 1926.

I now propose to put before you my own ideas on this subject of hedging in the Bombay market, but in doing so I would ask you to bear in mind that they are regarded with suspicion by the more conservative elements in the market, and you must not accept them, therefore, without determining their value for yourselves.

The chief critics of the existing hedge contracts have all along favoured a reduction in the existing number, and it is desirable that the motive underlying this criticism should not be lost sight of. It is contended that the present hedge contracts do not provide a real hedge against up-country purchases of cotton or against forward sales of cloth, and that these contracts (and especially the Broach contract) are so speculative in character that it is dangerous for any legitimate trader to use them as a cover. Obviously, the critics have in mind the single contract available in Liverpool, and would like a single contract in Bombay.

Before discussing the advisability or otherwise of making a change in the existing Bombay contracts, I propose to examine rather more closely the Liverpool hedge contract which is the model which so obviously appeals to the critics.

Under this contract, any quality of American cotton, if of fair staple or better, may be tendered, provided it is not lower in grade or value than Low-Middling-Grade, and value in Liverpool has reference to the amount of leaf and dirt in the lint and to the dullness or brightness of the cotton. Fair staple, which is a *sine qua non*, is not defined in inches, but is a term well understood in the trade and means the shortest staple generally used by the Lancashire trade.

The next important point to notice is that as the average buyer (and in particular the mill buyer) in Liverpool dare not risk being tendered any cotton from Low-Middling to something for which he might have to pay 1¼d. premium, he usually buys the exact spot cotton he requires and sells his hedge contract before the tender date. The result is that ready cotton is practically always at a premium over the current contract, the balancing feature being that the ordinary cotton dealer usually wishes to buy back his contract rather than tender against it, in order to secure the full benefit of the spot price.

Finally, I would refer you to the speech delivered at the Wembley Exhibition by the President of the Liverpool Cotton Association. In this speech he said, in describing the Liverpool system:—

> "It is imperative in such a system to have a free trading market . . . It is necessary to have professional jobbers willing to make a price at any moment . . . to have speculators who will carry heavy stocks when they are weighing down prices and who will sell contracts ahead when they believe prices are too high . . . to have manipulators who will keep the relations of spot cotton and futures together."

Obviously, the Liverpool contract presents immense attractions. The contract is wide enough to prevent cornering, while the system of marketing is such as to prevent the possibility of undue depression, it being recognised that spot rates practically always stand at a premium over contract rates. If we could introduce such a system in Bombay it would be to everyone's advantage—mill-owners, exporters and traders alike. The question is whether the system can be applied to Bombay, and in order to arrive at a conclusion the points you must take into consideration are:—

1. Are the cottons tenderable under the hedge contracts to-day sufficiently alike in character to permit of amalgamation of one or more of the contracts on the lines of the Liverpool model?

2. Does our system of arbitration enable us to say with a fair degree of certainty that a correct premium will be forthcoming (*a*) for staple, and (*b*) for grade over and, or, below the standard or standards?

3. Is our spot market sufficiently developed to permit partly or in whole of the Liverpool system?

4. Is the Indian banking system sufficiently developed to permit of spot cotton being freely "held" while free trading takes place in the contract?

5. Have we got a "ring" as in Liverpool to enable the correct recording and fixation of contract rates?

6. Have we got the requisite number of jobbers and speculators, and are they of the right type?

Mr. V. A. Grantham.

My own answers to these points would be as follows:—

1. A limited amalgamation of contracts is possible. A single hedge contract, embracing all descriptions, would appear to be an impossibility, but we might gradually arrive at one broad contract embracing half of the Indian crop.

2. I consider that the present system of arbitration does not lend itself to broad contracts, and that broad contracts could not be established unless there were confidence in the system of arbitration. At present that confidence is lacking.

3. The spot market is sufficiently developed to introduce, in part, the Liverpool system.

4. I doubt whether the Indian banking system is sufficiently developed to permit of spot cotton being freely held in the manner described.

5. Clearly, we have no "ring" as in Liverpool.

6. We have the requisite number of jobbers and speculators, and if they would consent to be controlled by a proper "ring" system it could also be said that they were of the right type.

My answers to these questions will make it clear to you that I agree with the principle of broadening existing contracts and to a gradual reduction of their number, but that I do not think the time is yet ripe to carry out extensive alterations, especially alterations that are only palliatives and do not go to the root of the trouble.

Coming, next, to a detailed criticism of the proposal to reduce the number of hedge contracts and to broaden those that remain, I would point out that as long as we are not, or cannot be, confined to a single hedge contract, there will always be the danger that speculators may ring one contract by straddling it with another. That is obviously the difficulty which the critics have in mind, and as it is a real danger to legitimate traders, and, as in my opinion the proposal to widen the existing contracts is only a palliative and not a complete remedy, I feel that an attempt should be made to meet the danger in another way, especially as on their own showing the mill-owners would be more likely to use a broad contract for selling purposes than for buying, which would be a source of weakness to the contract.

The only way to meet the difficulty, as far as I can see, is not to widen the contracts by linking two similar styles together, such as Fine and Fully Good Oomras, but to widen them by linking the different contracts wherever possible. By this I mean making C.P. No. 1 for example, tenderable under both Broach and Oomras, Tinnevellies and Cambodias tenderable under both Broach and Southerns, and so on. This arrangement would tend to make the three main *sutta* contracts, viz.: Broach, Oomras and Southerns move, more or less, together instead of independently, and the contract prices and the whole tone of the market would be dependent to a far greater degree on spot prices, which would in their turn regulate automatically the differences between the contracts for tendering purposes. I cannot see how Bengals can be linked with any other contract, but then Bengals do not provide a really popular *sutta* contract.

Bearing all this in mind, it will be clear that I do not think that the number of hedge contracts could be reduced below 4 for the moment, and I think the following 4 would be most practicable:—

(*a*) F.G. Bengals, as at present.

(*b*) F.G. Broach, as at present, but with the option of tendering C.P. No. 1, Tinnevellies and Cambodia.

(*c*) Fine Oomras, as at present, but Jalna and Fine Khandesh to be included and option of tendering any cotton that is tenderable under the Broach box.

(*d*) Good Southerns, as at present, but with the option of tendering any cotton tenderable against the Surat and Punjab-American boxes.

Oral Evidence.

57,060. *The Chairman*: Mr. Grantham, you represent Messrs. Forbes, Forbes, Campbell & Co., Limited?—Yes.

57,061. You were the first Vice-President of the Indian Central Cotton Committee, President of the Bombay Chamber of Commerce, Director of the Bombay Cotton Trade Association, a Member of the Cotton Contracts Board, and Director and Vice-President of the East Indian Cotton Association?—Yes.

57,062. Your firm submitted a memorandum to the Government of India last year on the influence of freight rates, protective tariffs, and the rate of exchange on prices of agricultural produce. You yourself, I take it, have had long experience of conditions in India?—I was sixteen years in Bombay.

57,063. From your experience of the working of the Indian Central Cotton Committee, do you judge that the principles upon which that Committee is constituted might be applicable to other lines of produce?—I think it might be applicable as far as its method of working is concerned. I do not know whether it would be applicable if you are referring to the cess which is directly levied on the cotton bales to provide for the cost of it.

57,064. Financing an organisation of that nature is one of the difficulties, and obviously cotton does offer certain facilities in the way of finance which other lines of produce do not afford?—That is true. What I really had in mind was that, possibly, agricultural activities would be greatly improved by co-ordination by a central body, even if no further money were spent on them than is at present spent.

57,065. Are you familiar with the practice of up-country marketing in cotton?—I have come into contact with it through my firm buying up-country. We buy very freely in up-country markets.

57,066. Have you formed the view that in cotton the cultivator receives a reasonable premium for quality?—No, I do not think he does, except in those markets where the whole arrivals are of equally good quality. If, in a market, the producers of good quality are in the minority I do not think they do receive the premium which they ought to get.

57,067. If the cultivator is to be encouraged to lay himself out to attain quality as well as quantity, it is very necessary, is it not, that he should obtain a reasonable premium for quality?—That is quite essential.

57,068. You point out in your note that the narrow margin between American and Indian staple cotton limits the demand for Indian staple. Is it your experience that a fluctuation in the market, due to that or other causes, is almost immediately felt by the cultivator, in terms of price to him?—Yes. Fluctuations in Bombay are to a large extent felt by the cultivator, except in the early part of the reason when the quality arrivals are exceptionally good. During that period, very often, up-country markets are considerably higher than the Bombay market, which is a typical terminal market and which is governed very largely by world prices. As the season progresses and arrivals are more free, then the price fluctuations are passed on fairly accurately to the cultivator.

57,069. So that the cultivator, finding he does not receive a sufficiently attractive price for long staple in one one year, leans towards the growing of a short staple cotton in the following year?—Yes, for varying reasons he would do that.

57,070. Do you think that hedge contracts affect the situation from the cultivator's point of view?—You mean the effect of hedge contracts on the market?

57,071. Yes.—I think they do, because if they are manipulated and not stable, they provide fluctuations which the cultivator has no means of foreseeing.

57,072. And fluctuations of that nature are particularly disturbing and demoralising to the cultivator, are they not?—They are very disturbing to him if he has to cart his cotton in from a long distance.

57,073. It has been suggested to the Commission by some witness that it would be to the advantage, both of the market in this country and to the industry as a whole in India, if improved varieties, as such, were recognisable by merchants in this country. That would involve their being sold under some special mark or designation. Do you think that is a feasible proposition?—I do not think it is feasible because, in the first place, I do not see how you are going to enforce their sale on the Continent on the description which you put on them in India. A merchant on the Continent is not compelled by the laws of his country to sell under any description other than the one he wants to sell under. I do not think it is desirable, apart from that, as I have stated in my note, because there are one or two districts now producing very similar types of improved cotton, and as the improvement of cotton growing continues in India, I think that feature is likely to increase, and it is very desirable, if a merchant makes forward contracts of a particular type of cotton for delivery on the Continent or elsewhere, that he should be able to supply an equally good cotton from another district if he finds the particular market from which he made his original type is being squeezed against him. If you pin a merchant down to selling cotton from a particular market he is very liable to be squeezed. He has to buy it because he has to sell it in many cases before it is even grown.

57,074. Is it the case that if an improved variety is produced in sufficient bulk, and if it is baled in a pure state and in good condition, it very soon creates for itself a demand in the markets?—Yes. I think there is a distinct demand in the various markets for the different types which are sent forward by the export merchants. Many of those types are pure cotton or as near to the pure cotton as can be bought by the ordinary merchant, and there is a demand for those types because they are pure. I do not think it really makes any difference to the buyer on the Continent or in England what a cotton is called as long as he knows exactly what he is getting.

57,075. On page 583 of your note you recommend the open cotton markets, on the managing Committees of which the grower has an effective voice, as being necessary to assure to the cultivator a square deal. From your practical experience, do you think it is possible to find, amongst actual cultivators, men who can hold their own and look after the cultivators' interests in a committee?—It is not easy to find such men. There has been a difficulty in the Indian Central Cotton Committee to find men who are really cultivators, and obviously there would be still greater difficulty in connection with quite small up-country markets; but I think men could be found who would more truly represent the cultivators' interests than the men serving at present on the various market committees.

57,076. Was it your experience that the cultivator's point of view and interests were sufficiently before the Indian Central Cotton Committee?—Yes, I should say that the cultivator's interests and point of view were more before the Committee than anybody else's. The whole efforts of the Indian Central Cotton Committee have been directed towards improving the cultivator's interests, because it was recognised very early that unless those

interests could be improved there would be no improvement in the growth of cotton which would be permanent.

57,077. Will you turn to page 589 of your note. I see that you definitely favour research carried out by the Central Government?—Yes. I think there is a good deal of research which must be carried out by them.

57,078. Do you mean because of the nature of that research, or because no Province is inclined to do it?—Largely because of the nature of the research. I do not think it is always possible now to co-ordinate the efforts of the various Provinces, and if they cannot be co-ordinated then the research goes by the board.

57,079. At present under the Reforms, the Central Government has no power to enforce, on Provinces, its views in matters of research. Do you think it possible to devise some means by which the opinion, not necessarily of the Central Government, but of some body envisaging the problems from the all-India point of view might bring their advice to bear upon the course of research throughout India?—I think it would be possible, but probably only by having commercial men sitting on a central advisory body. The presence of commercial men acting as a form of liaison between the provincial agricultural officers is desirable.

57,080. In order to bring research into line with the hard facts of the market?—Partly that, and partly because, I think, speaking quite frankly, there is a certain amount of inter-provincial jealousy in agricultural matters. A central committee on which there are commercial men sitting, so that the members of the committee are not entirely agricultural, would be helpful.

57,081. Would you hope to mitigate the ill effects of such professional jealousy as exists by introducing a non-professional element?—That has been the practical effect on the Indian Central Committee.

57,082. Would it be necessary, or advisable, do you think, to endow the central body, whatever it is called, with funds?—Yes. I think a body which is purely advisory and without any executive powers or money behind it, is not likely to go very far.

57,083. Executive powers are rather beyond the reach of any central body in the nature of the existing constitutional position, are they not?—Yes, if they have not got money of their own.

57,084. *Sir Thomas Middleton*: On page 583 of your note, you refer to the fact that there is a fairly consistent market for a certain proportion of short staple cotton. Can you give us any indication of what proportion this market bears to the total exportable?—I have no figures with me, but the Indian Central Cotton Committee did collect figures of the shipments of short as opposed to long staple. The Central Cotton Committee and the East Indian Cotton Association are the only bodies which could supply those figures.

57,085. Can you tell me whether it is a large proportion? Is there a market for three-quarters of the total Indian export crop as short staple?—It is difficult to venture an opinion from memory. I should say a fairly large proportion of what is exported now.

57,086. The demand formerly came largely from the Continent, I understand?—It came from Great Britain first and then from the Continent.

57,087. Now, I hear it comes from Japan?—Yes. The largest exports of Indian cotton are to Japan now.

57,088. Especially for this short staple?—The largest amount exported to Japan is composed of what we call, in India, medium staple.

57,089. When I asked about short staple I was thinking of some of the Central Indian cottons, like the Berar cottons. At the present time you find in Central India a good deal of short staple cotton, do you not?—Yes. The Berar staple is not looked upon as a long staple in India.

57,090. Short staples are now being increasingly grown in the Central Provinces, are they not?—"Short staple" as a trade term would be more applicable to the Bengal and Sind types. We should call the Central Provinces and Berar staples a medium staple, and the biggest amount sent to Japan are these medium staples, which are clean and white.

57,091. Some years ago the Central Provinces and Berar had a medium staple; but is it not the case that most of it is now a short staple?—Yes, I think that is so. I should say that the staple in the Berar and the Central Provinces first deteriorated when the big demand for yarn in China sprang up. I suppose the cultivator was also largely influenced by the rain factor, in that he is far less open to trouble from a shortage of rain if he grows a short staple.

57,092. There has been a large increase, in my own memory, of the amount of short staple cotton grown in this area, and what I want to know is whether the world's markets are likely to continue to absorb such short staple?—No, I do not think so. If one goes back a little further still, it was the rapid growth of the American crop which put the Indian staple crop in the background. The growth of the American crop is a fairly recent factor. I do not think there is an unlimited demand for short staple cotton.

57,093. I read into your note your opinion that we ought to aim, as a policy, at the longer and medium staples?—That is perfectly correct. We shall only sell the produce of India in really increasing quantities if we compete with American cotton, which is a staple cotton.

57,094. You refer to the difficulties that arise in connection with picking, and to improvements in picking cotton. What are the chief complaints: leaf and dust?—Chiefly leaf.

57,095. That is largely a question of variety, is it not?—Some varieties are very much more leafy than others.

57,096. This is a difficulty which the plant breeder may be able to breed out, is it not?—I have always been told by agricultural men in the districts where leafy cotton is grown that enormous improvements could be brought into effect if the cultivator picked his cotton at a different time in the morning.

57,097. The cultivator could do more no doubt, but the fact is that some cottons have very large bracteoles, and these are what cause the trouble?—Some must be more leafy than others.

57,098. This is a point which the agricultural departments are now attending to?—Yes.

57,099. You refer to bad ginning. To what extent have you handled saw-ginned cotton?—We have handled it to a fairly large extent.

57,100. Do you consider it better ginned on the average than roller-ginned cotton?—It is cleaner ginned, but I think it has a tendency to cut the staple.

57,101. Is the machine defective?—The effect of saw-ginning as such seems to cut the staple of Indian cotton in a way which perhaps it does not do in American cotton. I have tried experiments with saw-ginning cotton from various parts of India, and the reports I have had are distinctly against saw-ginning.

57,102. The difficulty is that when the lint adheres firmly to the seed you may cut it?—Yes.

57,103. With some varieties you get a very firmly adhering lint, and then there is damage done?—Yes.

57,104. I think the Cotton Transport Act now requires each ginnery to mark its own bales with its own stamp?—That is the Cotton Ginning and Pressing Act; it requires each press to put a mark on its bales.

57,105. That mark enables you to trace the bale back to the particular press or gin?—To the particular press.

57,106. Cannot you get at the gin?—It was found impossible to improvise legislation to get back to the gin.

57,107. You say that licensing of gins and presses has been tried in Rajpipla State?—Yes, in effect; the rules are very strict there against mixing in the ginneries; if mixing is carried out there are very heavy fines and, I believe, imprisonment.

57,108. *Mr. Noyce*: Have not they got over the difficulty by forbidding more than one kind of cotton to be grown in the State?—That may have been done in the course of years, but in the beginning, when this was started, there were two different kinds of cotton.

57,109. *Sir Thomas Middleton*: Rajpipla cotton was originally of rather low quality?—Very low quality.

57,110. And now the State authorities have replaced it by superior cotton?—Yes.

57,111. They have, in fact, tackled the question at the cotton-gin; what is your view as to the measure of success they have achieved?—The measure of success is enormous; the Rajpipla crop has improved out of all recognition; it fetches very high prices in the Bombay market.

57,112. If you take a gin in say the Central Provinces, coming into that gin you may have four or five quite different types of cotton?—Yes.

57,113. I should have supposed that, from the merchant's point of view, it would be a very great advantage to have the types ginned separately?—It is very difficult to make arrangements in a crowded ginnery.

57,114. Unless it were licensed?—Yes.

57,115. From the cultivators' point of view, there is nothing that leads faster to deterioration than mixing of seed cotton in the gins?—It must eventually affect his seed supply.

57,116. Do you consider the difficulties of enforcing a licensing system like the Rajpipla system would be impracticable?—I think there would be difficulties; I do not think licensing would be impracticable.

57,117. By the system of control followed in the State of Rajpipla?—The real trouble, of course, is inspection; the whole problem is whether the results are worth while.

57,118. There is everything to be said for the merchant being allowed to adjust his special type for export, but what one would like to do would be to deliver into the merchant's hands definite types of unmixed cottons, because this would allow of the seed being kept separate?—The merchants buy largely in the form of *kapas*.

57,119. If they do so, and mix the seed cotton, it is just as bad as if the up-country gin does so?—That is so. As a matter of practice, buying is largely in the form of *kapas*.

57,120. Supposing merchants buy largely in the form of *kapas* and desire to produce a particular type for export, do they mix before ginning or gin and mix afterwards?—They mix before the ginning.

57,121. Then we are faced with the difficulty of mixed seed?—Yes.

57,122. That is a most serious difficulty?—I consider it is serious, yes.

57,123. You say the available crop statistics and forecasts are not as accurate as they should be as regards yield; do you think they are as accurate as they could be?—I think they could be made considerably more accurate, yes; the figures show a very wide discrepancy between the eventual production and the forecast that is issued earlier in the year. I cannot see why the forecasts vary as widely as they do. I took out the figures for fifteen years up to 1924-5. In the first group of five years the discrepancy was sixteen per cent.; in the second group of five years the discrepancy was ten per cent.; in the third period of five years the discrepancy was seventeen per cent. It seems to me it is possible to estimate even a forecast at a time when the crop is half marketed closer than seventeen per cent.

57,124. I suppose it is the late pickings that upset the estimates; there is always uncertainty as to the amount of late crop?—Yes, that probably would be so to some extent, but my own impression is that the Government officers who make up the forecasts have to rely largely on their district officials in each village, and those district officials are all a little conservative; they would rather err on the right side than on the wrong side.

57,125. You mean there is always an under-estimate?—Yes.

57,126. *Mr. Noyce*: Your statement about the conservatism of the village reporters is undoubtedly correct, but how are you going to get over it? You propose to get over it by the presence of trained statisticians in the district. Is not that asking for rather a lot? What do you mean by a trained statistician in the district?—I mean a permanent official on statistical work only.

57,127. You do not mean one for each district, do you?—It could be a group of districts.

57,128. I quite agree that each Director of Agriculture should have a statistical assistant attached to his staff; would that meet the case?—That would very largely meet the case, because at present I understand the Director of Agriculture has to make up his statistics purely on the figures of the village officials and he has no professional help from a statistical point of view.

57,129. That is so, except in Madras. You are large exporters of cotton, I believe?—Yes.

57,130. And also users in India?—We also use it in our mills in India.

57,131. Do you export your own type?—Yes, we do.

57,132. If I may say so, your remarks in regard to mixing by exporters to secure their own specific types for export seem to me to be a very able defence of a practice the justification for which you are not quite sure about; that is the impression I got from reading it. I am not quite sure if the inference is correct?—I think the inference is a little wrong. What was really behind my note is that I think fundamentally all mixing of different growths is wrong and must react on the cotton growing industry in India; but I think it is the wrong end of the stick altogether to tackle it by saying that the difficulty will be overcome by exporters exporting on a farm name or a district name from India. I doubt if the mixing was begun by exporters; it was begun by middlemen who served the terminal markets, and naturally exporters followed suit, finding there was a market for mixed cottons and that they had to compete with people who bought their cotton in the terminal markets and shipped from them; and so the practice has grown.

57,133. Does not it come to this, that the sole justification for exporting a mixed type is that other people are doing it? Your only justification for exporters doing it is, as far as I can see, that other people do it, too, and if they did not do it they would find themselves in competition with mixed cotton?—If I may say so, I have not attempted to justify the practice. If you ask me what exporters gain from it, I think unscrupulous exporters can vary the quantities of their mixing and can get temporary advantages over their competitors. It reduces the whole trade to one of who is the cleverest in mixing. I am not attempting to justify the practice of mixing; all I am saying is that the exporters will do it, as everybody else does it, as long as it is permitted.

57,134. Is there any mixing of American cotton?—Do you mean in America itself?

57,135. Yes, I mean when the Liverpool purchaser is buying American cotton, does he get a mixture?—No, because the growths in America are far more akin.

57,136. Exactly: then he knows what he is getting, while he does not know what he is getting when he buys Indian cotton; does not that

react against Indian cotton?—I have said in my note that it does ultimately react; but the buyer knows what he is getting in a mixed type, because he usually tests it first, and if his tests do not work out regularly, he will not buy from that particular exporter on that particular type.

57,137. I do not quite see how mixing facilitates sales when the parity is against Indian cotton?—It comes to the case of the unscrupulous exporter who is mixing in a little more of lower cotton.

57,138. I had not grasped that that was the way in which the sale was facilitated. I take it that your view is that there is a demand for Indian short staple cotton outside India, but that it is limited?—Yes, that is so.

57,139. The proportion of Indian cotton relatively to American that Japan is taking has fallen in recent years, has it not?—Yes, the Japanese demand is regulated very largely by American prices.

57,140. Japan has been going in for the higher counts of late years, and that reacts against Indian cotton, does it not?—That certainly reacts, but the price of American has been more favourable, especially this last season.

57,141. Have you any close acquaintance with the Punjab 4F?—We have shipped it.

57,142. What has been your experience of it in the last few years?—4F, if I remember rightly, is the second; 285F is the longer staple.

57,143. 285F and 289F are the longer ones?—Yes, 4F was the old standard one that was introduced.

57,144. Yes?—I should say it has deteriorated during the last few years.

57,145. That seems to be the general experience, though the Agricultural Department are not prepared to admit it. Have you any idea to what the deterioration is due? In what way has it shown itself?—It has appeared to us in trying to buy pure staple that the staple is more mixed, in what is sold as pure cotton. It may be we are not getting entirely pure cotton.

57,146. Do you think the deterioration is due to more mixing or that there is an actual deterioration of the quality of 4F?—I think it is in the staple; I do not think it is in the strength or colour of the cotton. It is in the staple of the cotton, but whether that is due to mixing or the result of mixed seed I am not prepared to venture an opinion.

57,147. It must be due to the fact that the strain is wearing itself out?—Yes, it may be.

57,148. That, I suppose, would be too technical a matter for you to express an opinion on?—Yes, I could not say.

57,149. It is hardly necessary to examine you on the question of hedge contracts. I suppose you know that your views on that point have recently been supported by another Committee?—I was delighted to see that.

51,150. *Sir James MacKenna*: What is the real attitude of Lancashire to Indian long staple cotton? Do they regard it as an insurance against a failure of the American crop, or do you think there is a regular, constant and general demand for it?—I think it is entirely a question of price with the Lancashire mill.

57,151. Whichever they can buy cheaper?—Yes. I do not think they have got a fundamental objection to Indian cotton.

57,152. Has the demand for longer staple cotton increased during your residence in India, during the sixteen years you have been there: the consumption in the Bombay mills?—The consumption in the Bombay mills has increased, yes, in the higher counts I should say, definitely.

57,153. So that from the point of view of the Bombay mills there would be a considerable demand for a long staple cotton in India, apart altogether from export?—Yes, I think that would be the tendency.

57,154. I suppose price would hardly come in there? I mean the cost of importing American to India would be too great?—It only comes in after an exceptional year like the present one.

57,155. As a member of the Central Cotton Committee, do you think the expenditure of the large amount of funds you are giving the Indore Plant Breeding Station is a legitimate use of your funds?—Yes, I do.

57,156. Is cotton bulking very largely in their investigations?—Yes, quite largely.

57,157. And I suppose that was the reason why you gave this money?—Not the entire reason; we took the view that in a central research station it was just as well to find out something about other crops and their rotations when we were dealing with cotton, and that we could very well combine the two with advantage to ourselves.

57,158. That was the contribution of the Central Cotton Committee to the large amount of cotton grown in the Indian States, really?—Yes.

(*The witness withdrew.*)

The Commission then adjourned till 10.30 *a.m. on Friday the* 1*st July*, 1927.

Friday, July 1st, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN I.C.S. } *Joint Secretaries.*
Mr. F. W. H. SMITH }

Mr. VAUGHAN NASH, C.B., C.V.O., Vice-Chairman, Development Commission.

NOTE OF EVIDENCE.

1. The Development and Road Improvement Funds Acts, 1909 and 1910, set up the Development Commission (a body consisting of eight members appointed by Royal Warrant) to carry out certain specified measures for the economic development of the United Kingdom. The area is now restricted to Great Britain.

2. With respect to the purposes to be aided from the Fund which are mentioned in the Act, the following paragraph may be quoted:—

> "Aiding and developing agriculture and rural industries by promoting scientific research, instruction and experiments in the science, methods and practice of agriculture (including the provision of farm institutes) the organisation of co-operation, instruction in marketing produce, and the extension of the provision of small holdings, and by the adoption of any other means which appear calculated to develop agriculture and rural industries."

3. A sum of £2,900,000 was provided by the Act for the purposes of development. The total amount paid from the Exchequer into the Development Fund up to the 31st March, 1927 (including a special grant of £850,000 for use in England and Wales made under the provisions of the Corn Production Acts (Repeal) Act, 1921), has been £4,540,000.

4. The procedure prescribed for applicants for grants from the Fund is as follows:—

> Applications for advances under the Act, whether by way of free grant or loan, are sent in the first instance to the Treasury and by them are referred to the Government department concerned, which forwards them, together with their report, to the Development Commissioners. When Government departments are themselves applicants, their applications are sent to the Treasury and by them remitted to the Development Commissioners. The Commissioners consider every application so received and report to the Treasury. The Treasury may veto the recommendations of the Commissioners, but is not empowered to make advances from the Fund except on the recommendation of the Commissioners.

5. The bodies qualified to receive advances are:—

(*a*) Government Departments.

(*b*) Public Authorities, Universities, Colleges, Schools, Institutions and Organisations or Companies not trading for profit.

In the case of the second group, advances may be made either *through* a Government department, in which case the whole sum approved is granted, or lent, to the applicant; or as in the case of most advances for research and education, an inclusive grant is made to the Government department and is distributed to the various beneficiaries.

6. The Commissioners are also empowered to frame schemes with respect to any of the matters for which advances may be made under the Act with a view to their adoption by a Government department or a qualified applicant.

7. It will be seen that the Development Commission:—

(*a*) Is essentially, and in its usual method of conducting business, an advisory body to the Treasury.

(*b*) That it differs from an ordinary advisory body in controlling a fund which cannot be used without its sanction.

(*c*) That it has no executive powers in the usual sense. Once a particular grant has been recommended, the money passes beyond the control of the Commission; but as most grants are recurrent, and are made yearly it can, in fact, control expenditure; for, if money paid from the Fund is not used in an approved manner, renewal can be refused. Further, by attaching conditions to the advances recommended, a directing influence over the administration of these advances may be exercised, even when the grants or loans are not recurrent.

(*d*) That it occupies a position distinct from Government departments in the sense that it is free to report without reference to a Minister, that its recommendations are not subject to confirmation by Parliament, and that its status and procedure are laid down by statute.

8. Reference to the Parliamentary debates of 1909 shows that the Development Bill was intended to supplement existing activities and to provide a method elastic enough to permit of the endowment of experimental work and, at the same time, so related to the general machinery of finance and administration as to make feasible the introduction of greater cohesion and continuity into the work of Government departments, local authorities and scientific and educational institutions, so far as this was concerned with agriculture.

9. The position when the Commission came into being was as follows:—

(i) Three areas, each with its own Agricultural Department, came within its purview, England and Wales, Scotland, which had recently obtained its own Board of Agriculture and had accordingly severed its connection, excepting in the case of cattle disease administration, with the English Board, and Ireland with its Department of Agriculture and Technical Instruction.

(ii) The agricultural departments in each country were dependent on money voted by Parliament, most of which was devoted to routine services. Provision for research and experiment was meagre and uncertain, and indeed the whole conception of State-aided constructive work remained to be formed and adopted and carried out. No advice or assistance was available for rural industries.

10. It may be thought that the Development Commission was a somewhat fragile instrument for dealing effectively with such a situation. Constitutionally it was something of an anomaly and the Ministers responsible for agriculture might at any moment have taken exception to the terms and conditions attached to grants which it fell to them to administer. Difficult questions were certain to arise in the apportionment of a limited sum amongst

many claimants. Agriculture, though far the most important, was not the only beneficiary. The task of financial irrigation also had to be carried out, if possible, without doing injustice to the claims either of England and Wales, Scotland or Ireland.

11. Pains, however, had been taken, in framing the Act to equip the Commission for its task. A recommending body to the Treasury, it occupied a position of great strength as its recommendations, if adopted, became the Treasury decisions; and though it was a new thing for terms and conditions to be attached to supplies, the eagerness of the departments to push forward with constructive work generally outweighed any sense of resentment.

Further, the Act strengthened the Commissioners by dispensing them from the doctrine of territorial quotas, under which given percentages must be devoted to each constituent part of the United Kingdom and also by providing them a niche within the constitution which gave them protection from political pressure. Thus they were left completely free to deal with questions on their merits and but for this freedom, which entitled them, with great advantage to the subsequent scientific researches, to regard the United Kingdom as a single unit, they would have been gravely if not fatally handicapped.

12. It may also be noted that the methods of the Commission are not in any sense those of a super-department or an over-riding authority which, in the nature of the case, must present a large exposure to friction. It has been pointed out that the Commission may originate schemes, but in practice it has rarely done so. The schemes that come before it originate with the applicants and are discussed with them. Differences of opinion may and do arise as to validity and urgency of particular applications, the scale on which they should be undertaken, the amount of non-Governmental aid to be sought, and so forth. But such differences do not, as a rule, prevent a friendly negotiated agreement which can be recommended to the Treasury.

While it is natural for departments to take a departmental view, and institutions and societies which desire grants an institutional view, it is the business of the Commissioners to take a general view. They must consider the relation and possible reactions of a new scheme on existing schemes, see that the scale of salaries proposed is in accordance with scales for analogous services, make sure that duplication or injurious overlapping is avoided, that reasonable economy is observed and that the particular scheme is administratively feasible. They must keep an eye, at the same time, on the resources at their disposal and eschew anything that savours of largesse or doles. It remains the case when all these sources of difference are taken into account that the method of collaboration—necessarily tempered by criticism—has worked satisfactorily.

13. This team-work method, if it may be so described, has been facilitated by the circumstance that most of the grants paid out of the Development Fund have become indistinguishable to the public eye from other Treasury payments. So long, therefore, as the recipient observes the conditions, the schemes or services so aided bring such credit as they may earn to the department or body administratively responsible, in precisely the same way as if they had been paid for out of the Vote.

14. The Commission is empowered to constitute advisory committees and to obtain expert assistance. This power has been freely used. Standing committees on agricultural science and on fishery research have been set up, and from time to time temporary committees, such as that which in 1921 examined the position of research in animal diseases in this country, have been constituted.

15 Considerable additional sums have been made available for development purposes owing to the policy adopted by the Commissioners of requiring some measure of local assistance as a condition of an advance. There are exceptional cases where a condition of the kind could not in fairness be enforced, but as a rule the principle works well and incidentally provides the Commission with evidence as to the genuineness of the local demand for the particular projects put forward.

16. When the Commission was first appointed, a number of provisional grants were made to enable investigations then in hand to be continued under more favourable conditions. The whole system under which research and education in agriculture was being carried out was then reviewed and certain comprehensive schemes were adopted and received the sanction of the Treasury. These schemes constituted a settled policy towards the fulfilment of which the Commission has since worked.

17. In broad outline, it may be stated that in 1910 when work was begun it was found that the main wants of educational institutions were for suitable buildings and farms, that methods of providing local instruction were very unequally developed in different districts and required strengthening, and that there was almost a complete absence of facilities for research.

The scheme prepared and initiated involved:—

(1) The creation of a group of research institutes to work on specific branches of agricultural science.

(2) The formation of an advisory (or consultative) service to assist in bringing colleges, research institutes and farmers closer together.

(3) The provision of research grants to assist scientific workers not on the regular staff of any research institute.

(4) A scholarship scheme to assist in the training of new workers in agricultural science.

18. Full particulars of the working of these schemes will be found in the Commissioners' Annual Reports. The following notes indicate their general character.

19. There are (1926) twenty-six research institutes and experimental stations in Great Britain dealing with the following subjects:—

Soils: Rothamsted Experimental Station, Aberdeen University and College of Agriculture.

Plant Physiology: Imperial College of Science, London.

Plant Breeding: Cambridge University Institute, Aberystwyth University Institute, Scottish University Society.

Seed Testing and Distribution: National Institute of Agricultural Botany, Cambridge.

Fruit Industry Institutes: Long Ashton, Bristol, Chipping Campden (Sub-Station), East Malling, Kent, Cambridge University, Cheshunt Glasshouse Station, Wisley Fruit Testing Station.

Plant Pathology: Rothamsted, Cambridge University (Special for "Silver Leaf").

Animal Breeding: Edinburgh University, Cambridge University, Department of Genetics.

Animal Nutrition: Cambridge University, Rowett Research Institute, Aberdeen University.

Animal Pathology: Cambridge University, Royal Veterinary College, London, Animal Diseases Research Association, Edinburgh.

Entomology: Rothamsted.

Parasitology: London School of Tropical Medicine.

Engineering: Oxford University.

Economics: Oxford University.

Grants in respect of capital expenditure on buildings, land and equipment were formerly made direct to the institution aided, the payment being passed through a Government department. In recent years it has been found to be more convenient to make such grants to a Government department, so that the expenditure is brought under review on the department's Vote. Grants for maintenance have always been made to a Government department. For the year 1925-26 the following sums were allocated from the Development Fund in respect of research work:—

	England and Wales.	*Scotland.*
	£	£
Agricultural Research Institutes ...	223,800	31,200
Special Researches	4,000	6,482
Foot-and-Mouth Disease Inquiry ...	15,000	
Miscellaneous agricultural research schemes	2,010	

Grants of £5,300 for England and £1,130 for Scotland were also made for research scholarships and fellowships, for the expenses of representation at international conferences.

20. Grants for advisory work in England and Wales are made to the Ministry of Agriculture and for work in Scotland to the Scottish Board. Special research grants are recommended and Scholars and Fellows selected by the Commissioners' Advisory Committee on Agricultural Science. When the recommendations have been approved, sums sufficient to meet the expenditure are placed at the disposal of the departments and they distribute the research grants, and pay the stipends of the Scholars and Fellows.

21. The Commissioners have also recommended grants, over and above those made for specific and technological purposes, towards carrying out a large number of demonstrations, tests and experiments, ancillary to, consequential on, or independent of, the research work of the institutes and stations. These include large schemes for livestock improvement, surveys and work in connection with arterial drainage (both services are now financed from the Ministry of Agriculture and Fisheries' Vote), trying out methods of reclamation, testing crop varieties, examining new farming methods, experimenting in arable dairying, fruit preservation, milk-recording, electrical development of rural areas and many others.

22. Since the War, the Commissioners have taken the initiative, with the concurrence of the departments concerned, in promoting a movement in aid of rural industries. In 1921 the Rural Industries Bureau was set up under a Trust Deed by the Minister of Agriculture and under the control of a representative committee, and it has received annual grants from the Development Fund to enable it to obtain and disseminate information and advice to village craftsmen and others on equipment, materials, marketing costing, etc. A useful series of practical papers has been issued, and there is a quarterly periodical which pays its way. By working through the newly-formed Rural Community Councils, several of which are in receipt of grants from the Development Fund, the propaganda and advice prepared by the Bureau are percolating into the villages with good effect. Village industries have in this way received assistance which is highly valued, with appreciable results. The Development Fund has provided the Ministry of Agriculture and Fisheries with two motor vans containing smiths' mechanical equipment which are lent to County Councils for short terms, maintenance charges being met and an Instructor provided by the Council. Their visits have been appreciated by the blacksmiths, who travel in on their bicycles to the centre at which the van is halted. The local education authorities arrange visits of school children with whom the demonstrations of acetylene welding are popular. In several instances co-operative societies

of smiths and other craftsmen have been formed in order to acquire equipment suited to the needs of the day, and the Development Fund has guaranteed a sum sufficient to finance the first comers, the plan adopted being to supply the equipment on the instalment system. At most of the agricultural shows exhibits of country industries are now to be seen and an enlarged market for products has by this and other means been secured.

23. Women's Institutes have been aided since the War in respect of their headquarters expenditure (now borne entirely by the organisation) and handicraft training and organisation. This movement has done great things for the villages by drawing out and enlisting the talents and energies of women and girls of all classes. It has given a powerful impetus to drama, music, handicrafts and the study of local affairs, and the effect of its activities on village life and interests is very marked. Scotland has its own movement, which is no less successful, and an annual grant from the Development Fund is made to its Handicraft Section. Reference might be made to other schemes of the same nature aided by the Commission, which make for the development and amenity of the village.

24. For several years substantial grants were recommended in aid of agricultural co-operation in England, Ireland and Scotland. The Scottish Agricultural Organisation Society is now the sole recipient of such aid. Under the new regime in Ireland, the Organisation Society was split into a Northern and Southern Society, each of which has been in receipt of grants from its respective Government. In England the promotion and oversight of co-operation has, within the last few years, been taken over by the National Farmers' Union.

25. One important feature in the machinery for carrying out the purposes of the Development Commissioners may be noticed, namely that where an advance is made for a purpose which involves the acquisition of land, the body to whom the advance is made may acquire land for the purpose, and where such a body is unable to acquire the necessary land by agreement on reasonable terms the Development Commissioners may make a compulsory order for the purpose. The compensation to be paid is settled subsequently by an arbitrator. The Act exempts from compulsory acquisition certain kinds of land, e.g., grounds held with a mansion-house, or held by a company for purposes of a public undertaking, or forming the site of an object of archæological interest. It also provides that the Commissioners in making a compulsory order shall avoid taking an inconvenient quantity of land from any one owner and shall avoid displacing any considerable number of persons employed on the land.

The compulsory powers referred to have been very seldom exercised, but they afford a comparatively cheap and expeditious means of acquiring land for development purposes should such land be unobtainable by negotiation.

26. The Act which set up the Development Commission also dealt with road improvement, for which a Road Board (afterwards the Ministry of Transport) and a Road Fund were established. The Development Commissioners have nothing to do with road improvement as such. They act as an independent tribunal empowered to grant compulsory orders for acquisition of land by the Road Board or the Highway Authority where land is required for road improvement purposes and cannot be obtained by agreement on reasonable terms. The Commissioners have dealt with a considerable number of applications of this kind.

Procedure is laid down for receiving objections from owners. The provisions of the Act enable the process of compulsory acquisition of land for road improvements to be carried out much more simply and cheaply than under previous statutes. It has been found in practice that the mere

publication of the draft of a proposed compulsory order frequently has the effect of bringing the parties to terms. Similarly under the Forestry Act, 1919 (which transferred the promotion of afforestation from the Development Commission to a separate Forestry Commission), the Development Commission were constituted as the body to whom the Forestry Commissioners could apply for compulsory orders for acquisition of land for afforestation if they were unable to acquire it by agreement on reasonable terms.

27. Two further points of general interest may be noted in conclusion. By insisting on outside contributions towards capital expenditure and endeavouring to apply the same principle to maintenance expenses the State has been enabled to secure very large sums in aid of research work and to arouse the interest and co-operation of many societies and individuals. The same principle is applied in other departments of the Commission's work. The Carnegie Trustees and the International Education Board, founded by Mr. John D. Rockefeller, jun., are co-operating with them in certain directions and a gift of £10,000 was received from the Red Cross Society in connection with a scheme for enabling disabled ex-service men to take up rural industries. The general effect of the grants made has, it is suggested, been stimulating and not pauperising.

28. Reference has been made to the unified system of research which the Commissioners have taken part in building up (both in the case of agriculture and fisheries) and the advantages such a system offers over one divided into territorial compartments. It remains to add that by the adoption of this method the way has been kept open for establishing effective central contact with medical and industrial research at the points where concerted study and inquiry are likely to be fruitful and, similarly, for co-operating with the Empire Marketing Board in its efforts to utilise the home scientific stations for Overseas purposes.

Oral Evidence.

57,159. *The Chairman*: Mr. Vaughan Nash, you are Vice-Chairman of the Development Commission?—Yes.

57,160. How many years of experience have you had now in connection with the Commission?—It is about 16 or 17 years.

57,161. With that experience to judge of, do you think your particular public is satisfied with the working of the Commission and satisfied that its principle is sound?—Our public is a very limited public. So far as the recipients are concerned, I dare say their approbation is to a certain extent qualified by the amounts that they have received and the conditions attached to them. They may have hoped for more than they have got; but, speaking generally, I should say that the working of the Commission is regarded with satisfaction, and that those who have been connected with it, though they may criticise points of detail, are not disposed to quarrel with the general principle for which it stands. I do not know if that quite meets your point. I may say we have not a large public, because we are really, in a sense, a somewhat anomalous looking body: we have no executive powers, and a great deal of our work is therefore unknown to the public.

57,162. I think the Commission has seen every political party in this country in office since it itself was born?—Yes.

57,163. Has there been much Parliamentary criticism of the principle involved?—No, there has been hardly any; it is rather remarkable, but I should find it very difficult to recall any cases in which the Development Commission has come up for criticism.

57,164. It was an entirely novel principle when it was first introduced?—Absolutely.

Mr. Vaughan Nash.

57,165. There were no changes during the War?—No, the effect of the War was rather to hang things up; we had to go very slow.

57,166. I think you make the working of the Commission very plain in your note. Does it ever fall to the Commission to suggest or initiate any scheme and, more or less privately, to convey that scheme to a possible applicant?—Our suggestions, so far as they go, would probably be made in an informal way; we spend a great part of our time in negotiating and talking to applicants, and it has happened, I think not infrequently, that we have suggested that a particular course should be taken or even that a particular scheme might usefully be carried out; but that, of course, is different from introducing formally schemes to be carried out by other people; if we had embarked on that course, there would have been a good deal of friction and jealousy As it is, our powers of initiative have only been very rarely exercised formally.

57,167. Has experience shown that the Act, as framed, is adequate?—I should say on the whole, yes. There are certain points in the Act which we should like to have had drawn up somewhat differently. I do not know whether you would like me to refer to those now or later on, but in the main, I think, a device was constructed which has served its purpose effectively.

57,168. On page 602 at paragraph 14 you say: "The Commission is empowered to constitute advisory committees and to obtain expert assistance." Are those advisory committees constituted of persons altogether outside the Commission?—Yes, entirely outside.

57,169. Including the Chairman?—Yes.

57,170. And they advise the Commission; is that the position?—They advise the Commission. The question is now under discussion as to whether another advisory committee, dealing with agricultural scientific research on its broad lines, should not be set up. The Fishery Research Committee has been a very great success in bringing the different departments into line and in keeping a general view of fishery questions, and we are of opinion that a similar committee dealing with agricultural research might be quite helpful.

57,171. Is it your opinion that the principle of the £ for £ grant has made available, from the public, new money for scientific research which otherwise would not have emerged?—Yes, I should say so emphatically; it has been the means of raising very considerable sums of money. I have not got the exact figure, but certainly, if there had been no provision of the kind the money would not have been forthcoming to that extent, nor the interest nor the sense of responsibility aroused on the part of those, whether societies or individuals, who have contributed the money. I should say that in every respect it has been successful.

57,172. When you co-operate, if that is the word, with bodies such as the Carnegie Trustees or the International Education Board, do you discuss matters with the authorities representing those organisations, and do they claim a share in the direction of the business, or how do you work?—In reply to your second question I should say; I do not remember cases in which they have claimed a share in the direction, but the preliminary negotiations would usually be carried on by the applicant body with, say, the Rockefeller people or the Carnegie people, and when they came to us they would ask us for £ for £ according to the promises of help received. So that we are not brought very much into contact with them, though of course we see them from time to time and we know what is going on. As regards any dual control or clashing of control, I cannot recall any cases where that has even arisen on the horizon.

57,173. Are you familiar with Indian conditions at all?—No, I should hesitate to say I was familiar with them; I have been to India for two

or three months but I cannot say I know India. I have a very general idea of India conditions; it is twenty-seven years since I was there.

57,174. Do you find that some such organisation as the Development Commission and Fund might fit into the Indian world and enable a body of men taking the all-India point of view to keep the Provinces, as it were, in line on the broad questions of research, and generally to do for research in India what you seek to do for research in Great Britain?—With my limited knowledge, I should say that there was no reason whatever why that should not be so, and from our experience, which of course has not dealt with more than three territorial units, because Ireland came in originally, I can see no reason why eight bodies, I think that is the right number, in India should not equally be brought into line and enabled to co-operate for such common services as research, and this without any detriment to their individuality and their own powers of initiative and administration.

57,175. Any institution which dislikes any suggestion or condition that the Development Commission may make is at liberty to decline the grant and to close negotiations?—Absolutely; we do not exercise powers of compulsion.

57,176. But, as a rule, they try to be reasonable because you have got the money; is that the position?—Yes, generally speaking that would be so. Of course, at the start there would very likely be difficulties, but our experience is that as time has gone on and people have got accustomed to the Commission and accustomed to working with us, they have come to realise, which perhaps they did not at first, that we are not in any sense, as I have said in my note, an over-riding authority or super-department: that we are there really to work with them, to co-operate with them, and a large number of our schemes have been arrived at by give and take; they are quite often what you might call agreed schemes by the time our negotiations come to an end and are ready to go up to the Treasury.

57,177. The strength of your position lies in the fact that you are never called upon to give an order: you are never empowered to give an order to any institution?—Quite.

57,178. If any institution misbehaves itself, all you can do is to discontinue the grant?—That is so; we have no inspectors, we have no system of saying: "you are doing wrong," or anything of that sort. The administration is left to the department.

57,179. Has any friction arisen in the matter of inspection of the work on your behalf or by your agents?—No, I do not think so. We do not inspect. I should be inclined to draw a distinct line between inspection and visiting. If I may take the case of our Advisory Committee on Fisheries Research, they are men of high scientific position, and they go from time to time, or a sub-committee goes round and visits institutions and talks to the people; but they do not call them to account. Any inspection, as such, would be done by the departments and not by the Development Commission.

57,180. The Commission as such satisfies itself, firstly by these visits and secondly by the reports of the departments concerned; is that so?—Yes, that would be generally so. Also, of course, there is literature and there is personal touch. The Directors of the institutes are often in London, and of course Sir Thomas Middleton is frequently in touch with those. We are enabled by one means and another to keep, I think, a fairly clear general view as to what is happening. What we are hoping is that if an advisory committee is attached to the Commission, we shall be able to get a better particular view and a better scientific appraisement of the development of the work.

57,181. *Mr. Noyce*: Am I right in thinking that only two of the Development Comissioners are paid?—That is so.

Mr. Vaughan Nash.

57,182. How much work do the others who are unpaid do? How is your work divided up?—It is not divided up in any formal sense. Representation on the Commission is based on the idea that Scotland would have a member, that Ireland would have a member, and Wales, that landowners and farmers, farmers especially, should be represented on the Commission. Ireland now no longer comes in to our field. The Irish representative is still on the Commission. Usually, what would happen would be that if something connected with Scotland came along we should ask our Scottish member not only what his opinion was, but if he would go and look into matters, talk to people and then come and tell us about it.

57,183. *Sir Henry Lawrence*: Does Northern Ireland not come in?—No.

57,184. *Mr. Noyce*: Is the active work of the Commission carried out by the two paid members and are the rest more or less advisory?—Substantially that would be so as regards the first part of the question, but all come to the meetings and share equally in the decisions.

57,185. How often do you hold your meetings?—About once in six weeks or possibly once a month sometimes; we have no fixed interval.

57,186. *The Chairman*: You pay their expenses?—Yes.

57,187. *Dr. Hyder*: Are there any other statutory bodies like the Development Commission created by Parliament, or is the Development Commission the only statutory body of its kind in the United Kingdom?—When the Development Commission was appointed there was nothing else like it; since it was appointed there has been a body called the Forestry Commission which took over our work on forestry, but that is differently composed. It has financial and administrative powers of its own. It does not work through departments; it does its own work. The nearest analogy I know of to the Development Commission is a body known as the Universities Grants Committee. It is not a statutory body in the sense that we are, but it was appointed by the Treasury to make recommendations to them as to the State grants for Universities.

57,188. Apart from the functions which such a body fulfils, what is the constitutional principle involved in the creation of such a body?—The chief reason why the Development Commission was appointed was that the class of work which it had to attack, experimental, pioneering, constructive work, was unfamiliar to the State at that time, and provision was only made by the Treasury in an occasional and capricous way for meeting it. It was felt that if a body could be set up, with sufficient elasticity and sufficient discretion to deal with things which the more conventionally-minded departments would not easily adapt themselves to under their more stereotyped conditions, a move might be made. In addition to flexibility it was felt that it would be a great thing to have more continuity in this work, that if you were basing your finance on estimates made from year to year, a new Minister might come in, things might happen, your structure might suffer. Therefore it was felt that if you had a body at once sufficiently flexible and enabled to put up programmes and carry them through over a period of years, also a body that was not amenable to political or departmental pressure, a fair start might be secured. Does that meet your point?

57,189. Yes, that was the point I had in mind, that Parliament wished to interpose such a body, firstly to make the Development Commission act as a buffer against political pressure, and, secondly, to have continuity?—Yes, that is so. It may possibly interest the Commission if I read them a word or two on that point from Sir William Anson, who, of course, is a great constitutional authority. When the Development Bill was first brought in, it was proposed to set up a body of the nature of a committee, but purely advisory to the Treasury. Sir William Anson moved an amendment and in

the course of his speech he said he wished "to make this body as independent of political influence as it can be"; he went on to say that he was afraid of influences being brought to bear upon the Treasury which might be reflected on the Commission which, as the Bill stood, would be a mere creature of the Treasury. The House of Commons then passed what I might call a self-denying ordinance; it distinctly restricted its powers in order to secure, amongst other things, that the Development Commission might have a free hand, free from political pressure. Lord Robert Cecil took the same line strongly with, I think, very useful results to us.

57,190. In a country in which the executive is not responsible to the legislature, there is no fear of any interference or pressure being exerted by the legislature on the irremovable executive? I am speaking about the circumstances of India?—I take that from you, of course. I can only say that we felt the danger existed or might arise at any time, and we felt ourselves considerably protected by being able to tell Members of Parliament and others that we were not amenable to political pressure. I have known cases in which very powerful Ministers who have been asked for particular grants, and so on, have found it an advantage to say: "Oh, well, this is a matter for the Development Commission."

57,191. *Dr. Hyder*: Apart from the political and constitutional aspects of the matter, to what extent is it true to say that such a body was created because the Ministry or Ministries concerned had no institutions directly under them for carrying on research?—Their institutions were very limited, and the English Department of Agriculture, I know, had been greatly concerned as to how agriculture was to be developed, because under the existing arrangements with the Treasury the money was not forthcoming.

57,192. The Ministry of Agriculture had no agricultural research institution or agricultural college such as the Government of India has?—I would not like to say it had none; its provision was extremely limited.

57,193. Under what Ministry does this expenditure figure which is incurred by the Development Commission? Is it distributed over a number of Ministries?—No, not a number; it is mainly concerned with the two agricultural departments, the Ministry of Agriculture and Fisheries in England and Wales, and the Scottish Board of Agriculture and the Fishery Board for Scotland in Scotland.

57,194. Is it subject to review when the Vote is presented to Parliament? —No, not in the ordinary course. It cannot be questioned, in the sense that a Vote for which a Minister is responsible can be questioned.

57,195. I understand the Road Board has been merged into the Ministry of Transport?—Yes.

57,196. How much could the Road Board spend in any one year?—I am afraid I am not in a position to tell you that.

57,197. May I refer you to Section 13 of the Development and Road Improvement Act (*handing same to the witness*)?—Yes, but this was entirely a matter for the Road Board, although it came under this Act; we had nothing to do with that.

57,198. *The Chairman*: Is there anything to prevent a hostile majority in the House of Commons from repealing your Act and raiding your funds to-morrow?—No, they can repeal our Act to-morrow; I am afraid they would not get much if they raided our fund.

57,199. *Dr. Hyder*: Apart from this fund with which Parliament started the Development Commission, are you given any annual funds granted by Parliament?—The position is this; we have so far received, since 1909, the sum of £4,540,000.

57,200. *Mr. Calvert*: Does that include interest?—No, I was going to say I would like the Commission to know that, including interest on Exchequer bills, and so on, of which the funds consist, and also on loans

made by us, plus instalments repaid, the total available for development services has been about 5¾ millions.

57,201. *Dr. Hyder*: My point is this: are any additions made to this year by year?—Yes, we discuss that with the Treasury. Of course, I may say that what the Commissioners would have liked would be a recurring grant, on the same scale or approximating to the same scale, on which the fund was started. But financial conditions have not allowed of large increments to the fund, and therefore we have to be content with such annual payments as we can persuade the Treasury to put on their estimates for the year.

57,202. Are there any years in which you receive no money and the Treasury say: "Well, there are other things which are more important"?—So long as our Development Fund lasted we had no occasion to ask for supplements.

57,203. *Sir Thomas Middleton*: A point has been mentioned by the Chairman in connection with the negotiation with bodies like the Carnegie Trustees and the Rockefeller Foundation; I do not know that it was quite clear that in connection with the Rockefeller Foundation there has been a large amount of personal negotiation before anything is done?—Yes, I ought to have made that clear; I might have called it unofficial personal touch.

57,204. The Rockefeller Foundation consult us, and a scheme is discussed with them before any formal steps are taken by the Foundation?—Yes, quite so; but at the same time I do not think I am wrong in saying that the applicant authorities perhaps do the actual negotiation with these bodies, rather than the Development Commission.

57,205. That is so: the formal approach is by them?—Quite.

57,206. *Sir Henry Lawrence*: You spoke of these meetings of the Advisory Council taking place about once in six weeks?—That is the Development Commission, not the Advisory Council.

57,207. But you have two paid members and six advisers?—No, they are all of the same status; they are all Commissioners, but of those Commissioners two are paid.

57,208. How often do you have meetings of these Commissioners?—Roughly about once every six weeks, sometimes more often.

57,209. Would it be possible to carry on that work with your fellow Commissioners without these personal meetings? Could it be done by correspondence?—No doubt it could be done by correspondence and, sometimes, when urgent cases arise the work is done by correspondence; the application and papers are circulated and we receive replies. But of course there are obvious advantages in meeting, which perhaps I need not particularise.

57,210. You are familiar with the distances in India?—Yes.

57,211. It would be very difficult, in India, to organise personal meetings of gentlemen representing different Provinces of India?—I suppose that might be fatal really to frequent meetings.

57,212. Do you think the work could be done by correspondence?—I should have said a large amount of the work could be done by correspondence, but if it could be supplemented by a meeting now and then, it would be very advisable. The correspondence would necessarily be very lengthy, points might be missed and useful suggestions that might be hit upon when people met together might not arise owing to a meeting not taking place.

57,213. You have travelled in India, have you not? You know what the difficulties of travelling in India are?—Yes, I have travelled through the hot weather on a journalistic mission once, and it was not at all pleasant.

57,214. Was that in the famine of 1900?—Yes.

57,215. *Professor Gangulee*: On page 603 you tell us about the formation of an advisory or consultative service to assist in bringing colleges, research institutions, and farmers closer together; could you tell the Commission the composition of that service?—The advisory service is briefly

this: It has gradually grown and there are now some sixty advisory officers attached to agricultural centres, mostly agricultural colleges or universities, and the function of these advisory officers is firstly to advise, the advice being given very largely to the agricultural County Organiser, who passes on to the advisory officer conundrums sent to him by farmers and others with which he does not feel able to cope. Probably you are familiar with that part of the work. In the second place, the advisory officer is there in the course of his work to undertake particular pieces of research connected with the advice that he gives which can be usefully undertaken locally; but taking the broader view, the advisory officer is a necessary link between the research institute and the people through the Organiser; he is a link in the chain.

57,216. Was there no such service before the Development Commission came into existence?—No.

57,217. So that, since the formation of the Development Commission you have evolved this service, this link between research and the people?—We have developed it in collaboration with the departments and the institutions concerned. I add that because I am anxious that the Commission should not think we are sitting up in the sky, so to speak, evolving things; it is done in collaboration, as you know, with departments and institutions.

57,218. Why do you say that one of the reasons for the success of the Development Commission is the absence of executive power?—I should certainly say so. I would say so for this reason, that if you had executive power, you would have an almost certain clashing and friction with the existing executive bodies and you could not fit in the two to any executive machine that I can see.

57,219. With regard to research schemes, suppose you have a problem of investigation which you cannot entrust to some suitable body, are you not able to set up an independent organisation, an organisation of your own directly under you?—Probably what we should do would be to consult the departments concerned, or perhaps some particular institution and say: "Cannot you go to work with A, B and C and produce a body which would be equal to carrying out this particular scheme or job." I do not see any difficulties about it. We have frequently had to take measures to get some suitable body into being, perhaps for doing some bit of work ancillary to research or consequential upon it, or some particular bit of pioneer work. Would you care to suggest a concrete case?

57,220. I will take a most important problem before you now, the drainage question which a Royal Commission is considering. The problem of waterlogging is a serious one, and I do not think you have any institution in the country at the present time which is conducting researches on that particular problem of soil and water relationship. What is the position of the Development Commission in regard to that question?—As a matter of fact, this work has gone over very largely to the Ministry of Agriculture, who are now obtaining funds direct from Parliament for working it out, so that we have rather passed out of the picture. Things had to be done on an immense scale and changes had to be made in local Government for coping with the drainage question, so that I should rather hesitate to pretend to inform you of that.

57,221. Do you say that the Development Commission has developed the team-work method of investigation?—I use the expression "team work" in a rather informal sense. I wanted this Commission to understand not only how the Act looked on paper, but how it had worked out in practice, and in practice we have found that instead of writing a lot of official letters and conducting things in a strictly official manner, it has really developed into a system of collaboration largely between the departments. Of course, we have to see that the functions are not mixed up, and so on.

57,222. Perhaps that team-work method is developed in this way: your decision, whether a scheme will be approved or not, is based on a survey of the position and the needs of the whole country in relation to that particular subject; is not that the case?—Yes, that would be so.

57,223. Therefore, you do not recommend a scheme unrelated to the general scheme of things?—It would certainly be part of our business to see what its relations were and what its reactions would be on the general scheme, so far as our powers admitted.

57,224. So that you first take a comprehensive survey of the problem and allot, to various institutes, different aspects of that problem for thorough investigations?—That would be, roughly, the method.

57,225. That develops the team-work method, of course?—Yes, I have no doubt you are right.

57,226. You say the Development Fund has become indistinguishable to the public eye from other Treasury payments. Is it important that it should be indistinguishable from the other Treasury payments?—It all depends. I will put it in this way: A department, quite rightly, likes to get full credit for its work, and all I meant was that a grant from the Development Commission in no way derogated from its credit; that the Minister in making his speeches does not say: "Thanks to the Development Commission we have been able to do so and so"; he says: "Owing to the wisdom of the department, &c., &c., this great work has been done."

57,227. Does this process of submitting your approved schemes to the Treasury involve considerable delay?—No, I would not like to say considerable. Now and again, of course, difficult questions arise which may result in the scheme being held up for a considerable time; but in the regular way I should say about a fortnight or three weeks.

57,228. Do you take cognisance of applications from bodies other than Government departments?—Yes, we do; they are specified in paragraph 5: "The bodies qualified to receive advances are:—(*a*) Government Departments; (*b*) Public Authorities, Universities, Colleges, Schools, Institutions and Organisations or Companies not trading for profit."

57,229. How does an institute which is not a Government institute proceed to get a grant?—It is the same procedure; they have to apply in a specified way. I think I have handed in the paper on that to the Commission. The Treasury refers it to the department most closely concerned; we get the report of the department, and we consider the application in the light of that, though we are under no obligation to act on the advice tendered by the department; we must use our own discretion about that.

57,230. *Mr. Calvert*: Would it be correct to say that the restriction from the United Kingdom to Great Britain was due to an extension of provincial autonomy?—Yes, entirely.

57,231. Do you actually make any grants to financially autonomous Governments?—I am rather wondering as to the sense in which you use the word autonomous. Our only grants are made now to institutions or departments in Great Britain.

57,232. Exactly why were the two financially autonomous Governments of Ireland omitted from your scope?—Because under the Act which set up these new bodies that was specified; we had no say in that at all; that was decided by the higher powers.

57,233. The higher powers decided that the Development Commission were not suited to give grants to financially autonomous Governments?—No, it was owing to the new financial arrangements; Ireland under the new Act, I think I am right in saying, had to finance her own services.

57,234. The sum expended in the year, on the average, is practically no percentage at all on the total revenue raised in Great Britain?—No, there is no relation to that as far as I know.

57,235. There is no glory awaiting some enterprising politician who might abolish your Commission and then reduce taxation?—He might expect glory; he would not get it.

57,236. It does not offer any attraction?—No, it is quite inconsiderable.

57,237. In paragraph 5 of your note you divide the bodies qualified to receive advances into (*a*) and (*b*). Which receive most from you: (*a*) or (*b*)?—(*a*).

57,238. Government Departments?—Yes, they receive most, but perhaps I ought to say, as conduit pipes for feeding colleges, institutes, &c., &c.

57,239. Then, ultimately, (b) receives most of the money?—Ultimately, yes.

57,240. Could it be said that the grants to (*b*) drain away finance required for actual Government departmental work?—I do not think so; I think if that question were put to a representative of the departments of agriculture, he would say no.

57,241. Of the work which falls within your scope in Great Britain, the greater part is being done by the institutions mentioned in (*b*)?—Yes.

57,242. So that, really, in the absence of (*b*) entirely you would not have very much work to do?—No, not unless the Government departments themselves became the research authorities and built their own laboratories and undertook to supersede (*b*).

57,243. The note seems to me to bring out two rather important points: (*a*) that the formation of your Commission presumed the existence of activities referred to in paragraph 8 to supplement existing activities, and (*b*) it also presumed sources of origin of schemes?—Perhaps the words "supplement existing activities" ought to have been, in its terms, supplemented by some such phrase as: "to make good gaps and deficiencies"; because in addition to supplementing, of course, a great deal of constructive work had to be undertaken.

57,244. Apart from the theory of the Act, in actual practice has your Commission done much work which could not have been done by a special section of the Ministry of Agriculture?—It is difficult to say what might have been done if we had not been in being, but I should be inclined to answer that if there had not been a general, not overriding but overlooking, authority, having regard to the needs of the Kingdom as a whole and the bearing of one scheme on another, there would have been a great tendency to get a departmental and particularist view of agricultural requirements, and I think our function has largely been exercised in bringing things into line, in seeing that there was not unnecessary duplication or overlapping, and in resisting what is a frequent matter for resistance, a particular departmental view or mood. In my experience, things may go rather in moods and cycles in departments. It is possible that the Development Commission might not be immune from that, but I do attach importance to having a somewhat detached body which is not bound to take the departmental view, which takes rather a critical view of the question.

57,245. The impression I got was that the main value of your body is not so much in being outside the Ministry as that it is a permanent body charged with certain specific duties, and that those duties would receive constant attention; is that more or less correct?—I think that is correct, but at the same time we were put by Parliament outside the departments, and if we think a department is putting up an unreasonable or too lavish application we should have to ask them to modify their ideas.

57,246. *Mr. Kamat*: This Development Commission came into being about 1910 by a special statute?—Yes.

57,247. That was perhaps because of two things: the agricultural condition of England then, and, secondly, because you had to be invested with certain special powers; is that right?—Yes.

Mr. Vaughan Nash.

57,248. If that is the case, let us try to apply the analogy to India. Supposing a Development Commission were created for India, the same point is likely to arise, namely, whether this should be done by special statute if the Development Commission is to be given certain special powers?—Yes.

57,249. For instance, on page 601, sub-clause (*d*), you say that this Commission "occupies a position distinct from Government departments in the sense that it is free to report without reference to a Minister." Now that raises the point which has some bearing on India at the present moment. If a Development Commission were to be created and invested with power to report irrespective of the Minister, that would have to be done by a special statute?—Yes.

57,250. You agree?—Of course I agree. I bow to your knowledge of Indian conditions.

57,251. Yes, the facts being as they are?—I do not suggest for a moment that this is a model, say, for other countries; you may be able to make modifications in this which will suit the Indian conditions.

57,252. I do not mean to say that you are laying down a definite statement of policy; I only want to find out whether there is any analogy. In this country in order to invest this Development Commission with special powers, a statute had to be passed?—That is so.

57,253. Similarly, if special powers are to be given to a Development Commission in India, the point will have to be investigated whether with the existing machinery it could be done, or whether a special statute would have to be passed?—I imagine so.

57,254. Again, with reference to some conditions which were existing here when this Commission was called into being, I should like to know how far there is any similarity *pro tanto*, between the conditions prevailing in England, say in 1910, and the conditions prevailing in India from the agricultural point of view at the present moment. At that time in England there was a scramble, so to speak, in Parliament from two or three Boards of Agriculture in England, Wales, Scotland, and so on, for money; that is to say, your central legislature was being worried for grants by three or four different geographical Boards?—Quite.

57,255. In India I do not think the central legislature will be concerned to the same extent with this scramble which will take place, perhaps, in the Provinces?—I see. As we are on an analogy of the two sets of conditions, may I say that it was not only the Parliamentary scramble, to use your phraseology, but the Ministers were having pressure exercised on them for expenditure, and the Treasury was being bombarded in the same way, so that, if pressure had not existed in Parliament, pressure would still have been brought to bear on Ministers.

57,256. But am I correct in assuming that the Treasury in 1910 wanted to get rid of this attempt by various Agricultural Boards or Ministries to worry them for money, and that was why they interposed this separate Development Commission?—I think we are getting very near to the point. I should say that the Treasury did not interpose this body simply, as you say, in order to avoid worry; it interposed a body which was capable of advising them on a group of questions which the Treasury was not, without special advice, qualified to pronounce upon.

57,257. That is the second object, as you have described it, with which this statute was passed; but the first was, as far as I can see, what I was hinting at just now. On page 601, in paragraph 9, you assign two reasons why this Committee was called into being: the first was the territorial distribution, and the second was the advisory function?—Yes, quite. You understand that, through the Treasury, the departments have to be fed from year to year, but the arguments put up for, say, giving a Vote for the Colonial Office, or the Board of Education, would not turn on the merits

of particular schemes; it would not be complicated by all kinds of technical and scientific considerations. The Treasury does not make grants, so to speak, on the merits of particular schemes; it makes grants for blocks of national service. Here was a group of problems involving experiment, involving constructive work, involving a mass of novelties; therefore it wanted advice.

57,258. To turn for a moment to the second set of conditions: When this Commission was called into being in 1910, there was no sufficient provision for research, or agricultural education, and such services?—No, I must qualify that to a certain extent. There was very limited provision indeed for research work, but educational services of sorts were being conducted, partly under the Board of Education, and partly under the Department of Agriculture, but they were in a somewhat elementary condition compared with things at the present day. So that first statement would apply to research perhaps, rather more than to education.

57,259. Applying that to India, we have a Central Research Institute under the Government of India, and the rest of the research, for some time to come, will have to be left to the Provinces?—Quite.

57,260. India is divided into nine more or less autonomous Provinces?—Yes.

57,261. And anything that is to be directed, so far as research is concerned, cannot entirely be undertaken by the Central Government, but has to be done partly by the Central Government, while a good deal has to be left to the Provincial Government?—Yes, I quite follow that.

57,262. Now, I say, that is not so here in England, where you can do whatever you like with regard to multiplying research institutions under one central authority?—Are you suggesting that a particular scheme of research work should be laid down?

57,263. No, I am suggesting that your Treasury has ample authority, if so advised by the Development Commission, to go ahead as much as possible with as many institutions as they like, without any complications and entanglements with Provincial Governments?—Yes, I think that is so. The nearest analogy of course to your Provincial Governments would be the division between Scotland and England; but complications would not arise there, because we should see and advise the Treasury to take such measures as would be necessary to carry out a unified system.

57,264. With regard to the internal working of this Development Commission: you have a system of two salaried Commissioners and some non-salaried Commissioners?—Yes.

57,265. With regard to that, again I want to know whether this half-way house system works well?—I think it works admirably.

57,266. And it could be applied to India?—With regard to that, you see I am very ignorant of Indian conditions.

57,267. And Indian sentiment also of course?—I am afraid so; I think my opinion would be worthless.

57,268. Here, although you are given the fullest authority to allot grants to applicants, you have, after all, to depend on sub-committees. You make the statement in paragraph 14 of your note: "The Commissioner is empowered to constitute advisory committees and to obtain expert assistance." Although you are appointed as a special body of experts to deal with the all-England or United Kingdom problems, you have after all to appoint certain sub-committees. My point is: Are not sub-committees inevitable, although a Development Commission is set up?—I should say absolutely. The range of questions is so wide that you must call in experts.

57,269. If that is so in a comparatively small country like England, in India, which is perhaps six or seven times as large, do not you think you will have to carry on the administration of a Development Commission

through numerous sub-committees?—I think you will have to have a large number.

57,270. Either on specific problems or on geographical investigations?—I should say it is inevitable.

57,271. What therefore is also inevitable is delay, and an enormous amount of expenditure for sub-committees to travel about?—I do not know. There would be delay certainly, but I think delay is of the essence of the case, for delay is necessary for a good survey to start with, and a good foundation to build on. I will not say that if the Development Commission, had to do its work over again, it would go much slower than it did, but I do not think, looking back, it would regret such delay as took place in getting a good survey and a good understanding of the situation. You cannot rush this kind of work.

57,272. You are prepared to tolerate delay, but what about the other point: cost?—I do not like throwing out suggestions, but I should have thought a large amount of sub-committee work could be done without any great amount of travelling expenses. Perhaps you might get work which could sometimes be concentrated in a particular Province. I hesitate to express an opinion.

57,273. You are right in a way; you were suggesting that a particular kind of work can be done in the first instance in a Province?—Yes.

57,274. If that is so, I come to another possible objection; I am not stating it as a fact but I suggest that if a certain amount of spade work through a sub-committee of a proposed Commission is to be done in the Provinces, after all, it is only another way of duplicating what is perhaps done under an existing machinery in the Province, through its own agricultural officers?—Then I ask myself this question: Would it not be open to the central body, if something analogous to the Development Commission is set up in India, to say to the Provincial Government: "we want information on a particular class of pests," or whatever the case may be; "we know you have a good man at your Research Institute; cannot you form a sub-committee and report to us?"

57,275. You are assuming that the sub-committee of the Development Commission is necessarily a superior body to the kind of officers local governments have in the Provinces. Let us take a concrete case: suppose a problem has to be investigated in Bombay. The Bombay Agricultural Department has experienced officers to go into the general principles of the problem. The first spade work in any case they will do. No superimposed body from Delhi will be brought *ab initio* to look into that problem; all the spade work will have been done in the first instance through the officers of the Bombay Government. Now they apply for a grant; a sub-committee of this proposed Commission will be deputed from Delhi to Bombay to see whether the spade work done by the provincial officers has been done properly, or has gone wrong, or could be improved. Am I right in saying that that would be the situation?—I imagine that before the setting up of a sub-committee there might be a visit from a member of the Development Board or Commission to Bombay, which would result in consultations between him and the provincial authorities; that, as a result of those consultations, it might be found that the people on the spot could organise it advantageously.

57,276. That the people on the spot could organise it advantageously?—I should think so. I do not think it is essential to the idea of development that every sub-Committee appointed should be brought into this particular constellation; I should have thought you could have got sufficient variety and flexibility without it.

57,277. I should have thought that inevitably the provinces would have to organise the spade work themselves?—I cannot speak of things being inevitable in a country like India.

57,278. There are already certain Imperial officers to advise the Central Government at Delhi on technical questions?—Yes.

57,279. What will be their position when members of this Development Commission, or a supposed sub-committee deputed by this Commission, goes out to the Provinces to investigate a particular problem?—It would help me to answer if you could kindly tell me what functions are exercised by these officers or Ministers that you are mentioning.

57,280. At the Central Government, for instance, for forests, for irrigation, or for the veterinary department, there are All-India officers who assist the Government of India with technical advice?—Technical officers?

57,281. Yes; they are supposed to be highly experienced, knowing their subject, be it irrigation, agriculture, forestry, or veterinary, far better than the provincial officers?—Have they got executive powers, or advisory powers?

57,282. I think both. They advise the Government of India so far as technical questions are concerned, and they have under them a department in which they are to a certain extent also executive officers. They carry out a certain policy. Supposing a sub-committee or sub-committees of the Development Commission were to be the working agency for investigation of provincial problems, how would that fit in with the work of those Imperial expert officers who are already in existence and advise the Member in charge of agriculture at Delhi or Simla?—It seems to me the answer to that question and to similiar questions would depend very much on the kind of relationship which the Development Commission, as time went on, would come to form with the officers concerned. I think, in its early days, the Development Commission in England might have had a similar question put to it: How are you going to function with the big officers attached to the departments? How are you going to get on with this government and that government? I think the only thing to look to is that in practice you get an atmosphere, so far as you can, of collaboration, and that you do not use your powers, if you can help it, in a way which will bring you into conflict with others.

57,283. It was not of the conflict that I was thinking; I was thinking of how to fit in these existing officers; just as you have here a scientific technical adviser to your Ministry of Agriculture, so also, in India, attached to the members in charge of the Government of India there are these various officers. It was not the conflict I had in mind; I was trying to find out how, with the existing machinery, collaboration could be achieved, and if that could not be achieved, whether you would rather abolish those officers?—Oh, no; at least I should hesitate at the first blush to do it. Might I ask you a question: whether you foresee any serious difficulties in fitting those officers into a scheme where you would have something analogous to the Development Commission operating?

57,284. My own difficulty, to tell you frankly, is this: how to fit in with an existing machinery, where there is ample provision for technical advice, a machinery of a Development Commission which is also intended for technical advice and disposal of grants?—Cannot the new body, when it is set up, avail itself of the information in the possession of these technical advisers without duplicating such officers and without encroaching on their staff?

57,285. *Mr. Calvert*: Is the chief technical adviser at the Ministry of Agriculture one of your Commissioners?—No, but we constantly see him and, no doubt, we have benefited by his advice.

57,286. *Mr. Kamat*: I mean, speaking *a priori*, you would not advise the abolition of the posts of the existing technical advisers to the Central Ministry of Agriculture if the Development Commission were created?—I find it very difficult to figure out to myself the state of things in which that would be necessary.

Mr. Vaughan Nash.

57,287. Now, with regard to the existing financial machinery in India and the question of how any new machinery would work: I find your Development Commission here is practically the final recommending authority to the Treasury?—Yes.

57,288. That is to say, any recommendation that goes from you to the Treasury is final and it is practically beyond the control of the Ministry?—That is the procedure, the final word being with the Treasury.

57,289. Supposing I were to tell you that with the Government of India, at the centre, there already exists a sort of financial advisory body called the Standing Finance Committee, may I ask how it would be possible to give finality to the recommendations of a Development Commission in India when, already, an existing financial advisory committee has the power to turn down, or to uphold, certain recommendations?—Is that the position in India: that you have an advisory financial committee?—Yes.

57,290. *Dr. Hyder*: That body is on the same lines as your Standing Committees of Public Accounts and Public Finance; that is the position?—I see. Am I to understand that any proposal for expenditure would have to run the gauntlet of this Advisory Committee before it would get to what corresponds to our Treasury here, but which I suppose is your Finance Minister?

57,291. *Mr. Kamat*: I do not know, but, assuming that your supposition is right. If you had a statute on the matter, in order to facilitate it, could you make provision that the Development Commission could communicate direct with your Finance Minister?

57,292. Whether that has to be arranged or not I do not know, but I presume some special power will have to be given by new rules, or by statute?—Of course, on that I hesitate to express an opinion.

57,293. I am not sure whether I am right, but it seems to me the existing financial advisory committee may not like to be divested of its present powers, unless a special statute or something of that sort is passed. I am only speaking subject to correction from the legal point of view?—All I should like to say is that at the beginning when the Development Act was first passed, I think anybody would have been justified in saying: You have got an anomalous and rather absurd looking body, you are adding a fifth wheel to the coach, you will have friction with this man and difficulties with that man and so forth, and we do not envy you the job. But in practice, great pains were taken in getting the device set up properly, and thanks to our having a very elastic constitution and elastic powers, we have settled down with very little friction into our place.

57,294. You have been invested with certain powers regarding road development, acquisition of land, and such things?—Yes.

57,295. I doubt whether, in India, a Development Commission would be invested with similar powers: is it necessary that the powers of the Development Commission should go hand in hand with these powers?—Not a bit; it was a pure accident that it happened in this way.

57,296. Your Development Commission here appears to have done a great deal for rural industries?—It has tried to do what it could, it has made a beginning.

57,297. In the beginning it did?—I mean it is making a start at it; I will not say it has accomplished much, but it is trying to lay the foundations of some useful work.

57,298. Am I to take it that during the last seventeen years, although it has had the powers, it has not been able to do much in rural industries?—The position is really this, that when the Development Commission was first set up, it was very much preoccupied with other matters. The War came along and it could only do a very little, because the money was not there, and the time was not there; but as soon as the War was over, the

Commissioners applied their minds to the question of the rural industries problem. It was very much what the French call a *terrain vague*. It took a lot of time really to find out exactly what the problem was.

57,299. You mean you are not very enthusiastic about the progress made either during the War or after the War?—I am extremely hopeful that, with the steps that have been taken, extremely useful work may be done; but it has taken a long time to get the machine going, and the countryman here is somewhat slow; it takes him a long time to get acted upon by advice or propaganda. All I say is, I do not put forward extravagant claims for the work done, but I should be only too delighted to give you information as to the lines on which we have operated.

57,300. I am looking to the main point first; supposing a Development Commission of this sort were to be invested with powers, or rather, to put it the other way, if it were to be saddled with duties to encourage rural industries in India, can we expect much by the analogy of what has been achieved here through this Commission? Is it too much to be laid upon the backs of the Development Commission, or not?—No, I should say not; and I say not, because I think the step taken by the Development Commission to set up, and here it did exercise initiative, a small Institution which it subsidises to carry out the work—the Rural Industries Bureau —has been the means of taking a great load off its back. If you can get a suitable organisation of a central kind set up, operating through suitable provincial organisations, to carry on the work and get it to percolate through to the actual peasant artificers, or whoever they may be, on that general pattern, the thing should go.

57,301. In other words, you mean that even with a special branch of rural development in this Development Commission, you will have to fall back upon the Provinces?—Yes, I think you are so very remote, if you sit at headquarters and devise schemes and plans for benefiting the remote unit where somewhere out of your sight it is to operate; it is hopeless unless you get a good local organisation, co-operative society or otherwise, to deal with it.

57,302. In India, what is of great importance is rural development, apart from technical agricultural development of the villagers?—Yes, we feel that here too.

57,303. That is the chief problem?—Yes.

57,304. Now if a Development Commission were asked to set up a special branch, or a Development Commissioner especially charged with the problem of rural welfare, do you think it would be too far off in distance to do direct good in the Provinces and in the villages, or do you think it could achieve much?—I suppose he could travel about. How far do your villages in India conform to a general type? How far would what is true of a village in the Punjab be true of a village in the Deccan as regards economic conditions?

57,305. There are certain common features, but they differ in other respects. The point is not the difference of variety, but can one man at the centre in a big country like India achieve much through the interposition of the provincial departments, through whom he will have to work for the regeneration of the villages? Can a special branch of the Development Commission for the whole of the country do so?—I am inclined to say yes, I think it could; if you got the right man on the spot and then operating with sympathetic people in the Provinces, I think at the start of a movement like this, his initiative ought to be extremely useful.

57,306. And if a Development Commission is worth anything at all, you think there should be a special branch concerned with local welfare and local industries for India?—It depends very much on the extent to

which you feel, in India, that the existence of the village and the encouragement of rural crafts connected with agriculture are an essential part of your agricultural civilisation and development. I should be inclined to say that in England the existence of the village is very vital to agriculture. So long as agriculture requires men and people require food, you want to have a village which is sufficiently attractive to your labourer to keep him there more or less content; that means you want social conditions and so on, of a satisfactory kind, and I imagine agriculture in India would like to have supplementary and subsidiary industries to help things out, for the sake of the family, for the sake of the village, and for the sake of the farmer.

57,307. In this country you deal with an average, per annum, of grants to the extent of something like £300,000?—About that, yes.

Sir Thomas Middleton: Between £400,000 and £500,000.

57,308. *Mr. Kamat*: Say about £400,000. How much do you deal out on an average?—I have got our last annual report, which I should be glad to hand in.

Sir Thomas Middleton: It has varied since the War from about £800,000 to £400,000 pounds.

57,309. *Mr. Kamat*: Considering the size of India, if a Development Commission is worth having, there must be funds nearly four or five times as much as this before we can think of a Development Commission in India: do you agree?—Are you doing a sort of rule of three sum and saying that, if this little country wants so much, India ought to have so much more?

57,310. I am not speaking strictly in arithmetical proportions, but if a highly technical advisory body ought to be created at all, I am thinking of the funds which would be at its command?—I find it extremely difficult to say what would be reasonable for India, because I have not the data at hand, but may I say that a little money spent in this way may go a very long way in the early stages of survey and so on.

57,311. Do I correctly understand you to say that with a little money a Development Commission would be of use?—I am inclined to think so. May I put it in this way: that if it comes in stages, your first stage may mean a lot of enquiries and survey work, which would not necessarily require very large sums.

The Chairman: Could you tell me approximately what proportion of the £400,000 is spent on agricultural research?

Mr. Calvert: Do you mean apart from buildings?

57,312. *The Chairman*: Yes. It seems to me that the proportion which the amount spent annually by the Development Commission bears to the total from all sources spent on research in the country is the important point?—I am afraid I could not say with regard to research paid for from all sources. We could look into that and hand in a statement.

57,313. Plainly the important point is what proportion of the total expenditure you require to have in the hands of your Development Commission in order effectively to influence the course of the whole?—Exactly.

57,314. *Dr. Hyder*: Will you please look at Section 3 of the Act. There is nothing laid down in the Act as regards the qualifications of the six other members. Judging from experience, on what sort of persons has His Majesty's choice fallen? I want to know especially in its application to India. Have men been selected who are high in the scientific world or high in public life, or Members of the Houses of Parliament, or who are notable in business and industry?—I think perhaps the most convenient plan would be if I were to refer you to the present list of Commissioners.

57,315. I do not wish to go into the qualifications of these gentlemen?—I am only too glad to try to answer your question.

57,316. Suppose we decided to set up a Commission of this sort, what sort of advice would you give as regards the qualification of the members of such a body for India?—You would want to have somebody who knew something about the job, would you not?

57,317. The job would be connected with agriculture, rural development and industries; you see we have not many men to choose from in India; what advice would you give us?—I should have thought the great distances in India would have made the selection of honorary members extraordinarily difficult.

57,318. Then in your opinion it would be better policy to have a Commission consisting of four or five members and all servants of the Crown?—Of course, I do not know how far, in your centres, you would be able to get sufficiently representative men to act on behalf of India as a whole, without bringing them up from very long distances. I do not like to say too much about this, because I know so little of Indian conditions, but I imagine that if you had simply two or three paid Commissioners without their unpaid colleagues, the work would suffer. If you sit round a table discussing things with a farmer, a landowner, a scientific man and so on, you get very great advantages over a meeting of two or three officials.

57,319. Then it would be desirable, in your opinion, to have honorary members representing different aspects of national life?—I think if you could get them it would be extremely useful.

57,320. Judging by the size of the country to which this idea might be applied, do you think it would be desirable to have a Development Commission in each of the Provinces?—I should have thought not; I should have thought you would do far better to start, at any rate, by having one central body getting into touch with the Provinces and helping them in their work.

57,321. Your function was to co-ordinate these various activities, but at present this co-ordination is lacking in the case of two countries: Northern Ireland and the Irish Free State; I mean there is no co-ordination with them?—No.

57,322. The only kind of co-ordination that is at present being carried on is between Scotland, England and Wales. Do not you think conditions here are very favourable because all the strings are in the hands of the Treasury?—One Treasury.

57,323. You have got one Treasury?—Yes, it would be complicated if you had more than one Treasury, I agree.

57,324. *Sir Henry Lawrence*: Has it been an important function of your Commission to safeguard the Treasury from wild cat schemes?—Yes, I think it has distinctly.

57,325. Has that been as important as the initiation and encouragement of schemes which would otherwise have lacked encouragement?—No, I do not think I should say that, but I think I could pick out quite a good bundle of more or less wild cat cases which we have spared the Treasury from helping. I do not like to particularise.

57,326. *Professor Gangulee*: Has anything been done by your Development Commission for afforestation work in this country?—Yes, when we were set up we were given powers to deal with afforestation, but as time went on, during the War, the Government came to the conclusion that a separate afforestation body was needed, a body that would have its own officers and its own executive power and its own finance; so the powers were transferred from us to the Forestry Commission; we no longer function in that respect.

57,327. Do you publish anything besides your reports? Have you any scientific publication?—No, we publish an annual report which I will hand in if I may.

Mr. Vaughan Nash.

57,328. Have you any scientific publications on research?—No, we are not a research body; we are a research grants recommending body. If they are of interest, may I hand in some papers?

57,329. *The Chairman*: Thank you very much. Your work in the villages may be divided between rural industries, I mean the village blacksmith, wheelwright, and so on, and spare-time occupations of the ordinary farm labourer living in the village?—Yes.

57,330. In which have you been most successful: in the first or the second group?—I think we have been fairly successful in encouraging both groups. The second group were chiefly members of the women's institutes both in England and in Scotland, a large number of whom are practising handicrafts of sorts, and by making a grant to the Federation they have been able to do a lot of organising, judging and educational work, which would otherwise not have been done.

57,331. How about the marketing and organisation and sales arrangements? Has that been difficult with regard to spare-time occupations?—All I can say about that is that by rousing local opinion and getting people to exhibit at agricultural shows, organising exhibitions here in London, and so on, we have been enabled considerably to widen the field of marketing and stir up a good deal of interest amongst the consuming public.

57,332. Have you been able to form co-operative societies for the purposes of organising villages?—Not to any great extent; but as regards people like blacksmiths, wheelwrights and so on, the Development Commission have given guarantees of small sums, say £500 to co-operative societies to be used for equipping blacksmiths, wheelwrights and other people with suitable equipment. The appliances of a lot of these people of course are very elementary and they could do much better if they had a little more machinery, and special societies have been set up with the object, and, as time goes on, they are co-operating for other purposes besides the credit side.

57,333. I understand how you get to work in the case of the village tradesmen, the blacksmiths and carpenters; my difficulty is to see how you are arranging for the sale of things like rushwork and the products of typical spare-time occupations?—As a matter of fact, we are not doing very much on those lines; it is so largely in the hands of women's institutes, which are much more concerned with getting into the houses of their people: what I call renovating their houses. Their handwork is done more to keep the house nice; I mean the making of mats, baskets and whatever it may be, is not done so much to sell the things as to get the things into use. The women's institutes are very keen on keeping that side uppermost.

57,334. That, no doubt, is an excellent object, but, after all, you cannot found a local industry in rush mat making on the local demand for rush mats?—The tendency amongst the women's institutes is that if they get sufficiently skilled people or if they get a surplus amount of part-time work, after providing for the needs of the home, to make their own local arrangements for the marketing.

57,335. *Mr. Calvert*: Assuming for a moment, on Dr. Hyder's idea, that we were considering a Development Body for each Province, do you think it would be essential that the Minister should stand outside and divest himself of his power and control?—Yes, absolutely.*

(*The witness withdrew.*)

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* *Note by Witness.*—The point I had in mind was that, on the British model, Ministers would stand aside from the allocation of a Development Fund.

Mr. E. GODFREY PELLY,
(of Messrs. John Fowler & Co. (Leeds), Ltd.).

Replies to the Questionnaire.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) Demonstrations calculated to impress upon cultivators the value of deeper and more efficient cultivation have been carried out by the Government of India and by various Provincial Governments in the only practical way, i.e., by operating the machinery continuously under ordinary working conditions and demonstrating the improved results obtained.

Work has been done on these lines with Fowler cable ploughing tackles by:—

The Government of India at the Imperial Agricultural College, Pusa.
The Punjab Government at the Agricultural College, Lyallpur.
The Bombay Government. (Two sets of tackle.)
The Central Provinces Government.

In the two latter cases work is done on the cultivators' own land by contract. The machinery is run on a self-supporting basis and the cultivators are themselves able to judge of the value of the work from the improved results obtained.

We suggest that this system of continuous demonstration on a self-supporting basis should be extended to other Provinces and that Indian Rulers should be approached with respect to introducing modern and up-to-date machinery in a similar manner.

One object of such demonstrations is to induce local contractors or associations of cultivators to take up the working of such machinery for themselves and suggestions for financing such undertakings are given in reply to Question 14 (*d*). As instances of the success of these plants may be mentioned the fact that when, in 1920, it was proposed to send one of the Bombay tackles to Mesopotamia, the cultivators in the district where it was working petitioned the Government against its removal.

The Pusa Agricultural Institute which have used their ploughing tackle since 1913 publish figures of the cost of working every year, from which it appears that the cost of ploughing works out at an average of Rs.5-8-0 per acre and of deep cultivating at Rs.2-1-7 per acre.

QUESTION 9.—SOILS.—(*a*) Suggestions for the improvement of soils.

1. *Drainage.*—This can be carried out most economically by hole draining with cable ploughing tackle.

In clay soils the mole drains will keep their form and continue to carry off water for many years.

In lighter soils where mole drains would silt up, tiles may be inserted by means of the Fowler patent mole tile ram.

If open ditches are required either by themselves or to act as collectors of the water from mole drains they can be made with the ditching machine operated by cable tackle at a very low cost.

2. *More thorough cultivation.*—In dry tropical climates marked improvement in the yield of nearly all crops is obtained by deeper and more thorough cultivation. This is found both on irrigated and unirrigated land. The more deeply broken land is better able to absorb moisture and retain it for the use of the crop, while the crop roots can spread further in search of nourishment.

On irrigated land much better use is made of the available moisture. In Peru, for instance, it is found that after ploughing eighteen inches deep,

one irrigation every fourteen days has the same effect as an irrigation every five days after ox ploughing. This means that with deep ploughing nearly three times the area can be irrigated with the same quantity of water compared to ox ploughing.

On shallow soils where the subsoil should not be brought up to the surface by the plough the subsoil plough may be used or the normal ploughing may be followed by the deep cultivator or knifer working from fourteen to twenty-four inches deep.

3. Pulverisation.—(i) Thorough breaking up of the surface soil forms a mulch which is the only effective method of preventing undue drying of the ground by evaporation. This work is most effectively done by the cable tackle because of the high speeds of working, up to six and even eight miles an hour. High speed multiplies the effect of such an operation many times, whether it is carried out with a discer tyne harrow or spring tyne cultivator.

All the implements mentioned above have been used very successfully in India and several of them have been specially modified to meet Indian conditions.

(ii) Reclamation of alkali and other uncultivable land.

1. *Alkali land.*—The following procedure has been employed. First drain the land with mole drains at a depth of twenty-four inches, leading the main drains into tanks where the alkali may be evaporated out and recovered. Then cultivate the surface thoroughly and apply irrigation water to wash out the alkali.

In one case in the Punjab where this process was tried, a record crop of wheat was afterwards obtained from the land and a valuable deposit of alkali salts was also recovered from the evaporating tanks.

If the alkali shows signs of working its way up again from the subsoil, as may happen after a few years, the operation must be repeated, but provided that the irrigation water is available the cost is only small when cable mole draining is employed.

2. *Other uncultivable land.*—(i) Land infested with *hariali*, *kunda* or *kans* grass. The following procedure has proved effective for eradicating these grasses.

Plough up the land to the greatest depth to which the roots penetrate so that all the roots are turned up to be dried in the sun.

In the Bombay Presidency, *hariali* and *kunda* grasses have been eradicated successfully in this way by ploughing sixteen inches deep.

In the Central Provinces a cable ploughing tackle was started last year for dealing with *kans* grass, ploughing ten to twelve inches deep.

(ii) *Virgin land.*—This can be broken up by cable ploughing tackle working with knifers, breaking ploughs, or in special cases railway irons have been used for tearing out large tussocks of rough grass.

For pulling down trees and uprooting stumps the Fowler special forest-clearing engine may be used and the roots may be subsequently extracted with the knifer. Bamboo roots can also be torn up with the knifer.

(iii) *Soils underlaid with hardened subsoil or pan-murum*, a very hard subsoil lying at depths from six to fourteen inches below the surface, has been successfully broken up with cable ploughing tackle on the estates of the Belapur Sugar Company near Bombay.

Black cotton soil with a hardened pan three inches below the surface can also be successfully broken up in the same way.

Hardened subsoils such as these make successful cultivation impossible and the cable ploughing tackle with its powerful implements is the only method of breaking them up properly. (c) Measures which the Government might take to encourage the reclamation of areas of cultivable land which has gone out of cultivation.

This depends, of course, upon the reasons why the land has been left uncultivated.

In many cases it may be because the top few inches of soil only have been cultivated by primitive implements until their fertility has been exhausted. Deep and thorough cultivation will bring fresh virgin soil to the surface, renew the fertility, and make the land again attractive to cultivators.

In other cases, it may be that the land has become infested with grasses or weeds which may be destroyed, as explained above.

In most cases where there is nothing radically wrong with the land, proper cultivation with up-to-date machinery will put it again into a condition to produce profitable crops.

Such work could either be undertaken by the Government direct, recovering payment from the cultivators after the following crop, as has been done in the Dharwar District, Bombay Presidency, or they could encourage contractors to undertake the work by subsidy or financial assistance in buying the tackle. Even if the whole cost of cultivation cannot be recovered, the Government will gain from the increased revenue obtainable from the larger area of land under cultivation.

Work of this kind with the object of increasing revenue has been undertaken by the Maharajah of Gwalior in Gwalior State.

QUESTION 12.—CULTIVATION.—(i) We suggest that the cultivators should be educated up to replacing ox cultivation by mechanical cultivation with machinery which has proved to be suitable for Indian conditions.

QUESTION 14.—IMPLEMENTS.—(a) Attached is a list of implements which have been specially designed or specially modified to meet Indian conditions. Such special implements have been designed after personal visits by our expert representatives in India to view the actual working conditions and make recommendations. The introduction of such special implements also involves other visits, after the machinery has been started, to make sure that the work is thoroughly satisfactory or to make any alterations or adjustments necessary to obtain the best possible results.

(b) The two chief difficulties are: 1. Ignorance and lack of appreciation of the benefits obtainable with improved implements. This can only be overcome by actual demonstration of the improved results obtained.

2. Lack of capital. The Government can help to overcome this difficulty by means of loans or credit facilities. Such arrangements can easily be made for cable ploughing tackle, owing to its long working life. Payments can be spread over a number of years and the plant always remains as security for any outstanding accounts.

An alternative method is for the Government to remain owners of the plant and to hire it out to users, whether contractors or individual cultivators or co-operative associations. Under such circumstances the Government would have to exercise enough supervision to see that the plant was kept in working order and operated by men who understood how to work it.

LIST OF IMPLEMENTS SPECIALLY DESIGNED FOR WORK IN INDIA OR SPECIALLY MODIFIED TO MEET INDIAN CONDITIONS.

Date.	Description.	Customer.	Special features.
1926 ...	Five Furrow Fen or Marsh Land Plough.	Punjab Irrigation Department, Lahore.	A specially light machine fitted with skids and double wheel.
1914 ...	Mole Drainer ...	Punjab Agricultural College.	Specially designed grading gear.
1920 ...	Combined Disc and Flat Harrow, and Grader.	Punjab Agricultural College.	New type of grader for land levelling.
1913 ...	Six / Seven Furrow Disc Plough.	Agricultural Research Institute, Pusa.	Entirely new design of discs and disc bodies.
1914 ...	Four/14" Furrow Zigzag Frame Plough.	Bombay Government, Poona.	Specially light type designed for Indian work.
1920 ...	Eleven Tyne Special Colonial Cultivator.	Turner, Morrison & Co., Ltd., Calcutta.	Extra strong type with types 12" apart instead of 10".
1912 ...	Three/16" Furrow Zigzag Frame Plough.	Smith Estate, Kolassy	Specially deep plough bodies for ploughing in jungle grass.
1913 ...	Two Furrow Trenching Implement.	East India Distilleries & Sugar Factories, Ltd.	New design.
1920 ...	Three Furrow Ridger	Belapur Sugar Co. ...	For cane rows at special centres.
1914 ...	Seed Drill for jute, wheat, etc.	Birkmyre Bros. ...	Specially designed.
1920 ...	Jute Reaper ...	Birkmyre Bros. ...	Specially designed.

Oral evidence.

57,336. *The Chairman*: Mr. E. Godfrey Pelly, you are of Messrs. John Fowler & Company Limited. This Commission has had the advantage of hearing evidence a day or two ago from gentlemen speaking for the Agricultural Engineers' Association; is your firm a constituent member of that association?—Yes, but we are members of it for other machinery than the machinery of which we are talking to-day; that is, we are not members in our capacity as makers of heavy machinery.

57,337. We have your note of evidence; would you like to make any statement at this stage or to make any correction?—I would like to make it quite clear why we asked you to allow us to give evidence rather than through the Agricultural Engineers Association. That is an association of makers of light agricultural implements and also, in the heavy sections, of road rollers and traction engines for threshing machines and so on which we also make, but they do not represent us in any way, nor have they any section for this particular double engine cable system of cultivation.

57,338. It is as to that that you desire to give evidence?—Yes, it is as to that particular machinery and the uses to which it has been put in India already, and the further uses to which we think we might put it in the future.

57,339. Are you familiar with Indian conditions?—I am personally to a certain extent, not a very large extent, but, from reports of the machinery that we have already had working there, we are very familiar with it as a firm and have numerous reports and accounts of the work our machinery has been doing.

57,340. What is the smallest field to which that heavy type of machinery could be applied?—It is applied in this country to fields of ten acres, but it is not very economical on a large scale to work fields of that size. I prefer a field of not less than 400 yards square.

57,341. What is that in acres?—That is 33.06 acres; that is to get the maximum efficiency from the machinery. Smaller fields can be worked and worked efficiently.

57,342. What types of farms in India have you in your mind as possible users of that class of machinery?—At the moment I have not any particular type of farm in mind; I have more in mind the reclamation of land which is not producing what it should: land which has gone out of cultivation, and land which can be brought into cultivation which has never been in cultivation before. As far as farms are concerned, India, as far as I know it, is divided up into small areas being worked by cultivators who rent the land; they naturally cannot possibly afford to buy large machinery of this type. They could be induced to improve their cultivation by hiring this machinery in exactly the same way as it is done in England to-day, but before that can be done somebody has got to give the lead to the man who will eventually buy the machinery and hire it out to the cultivator.

57,343. Do you contemplate the ryot who is cultivating seven to ten acres of land being in a position to hire this class of machinery?—No, he is not the size of cultivator that I should have in mind; the smallest area of cultivator I should have in mind would be the fifty acres man.

57,344. How large a unit do you think is necessary, under British conditions, for the economic employment of heavy machinery like this, that is to say, the total size of the farm?—2,000 acres.

57,345. Nothing less than 2,000 acres?—In England.

57,346. So that you have to get a group of farmers together, or arrange for the hire by individual farmers before you can usefully invest in the heavy type of machinery in this country?—Certainly; that is what is done with practically all the sets in this country.

57,347. Are they owned by private enterprise and leased out to farmers?—Yes.

57,348. Are there any cases where farmers, organised co-operatively or on a joint stock basis, have used the implements?—Yes, there are cases of that. As a rule, those co-operative farmers do not pay a dividend.

57,349. In the main, you look to the reclamation of land as the most likely direction?—That is where our machinery is most useful and satisfactory in India.

57,350. Have you any business in India at all?—We have an enormous business there; we have our own house there and our own men, and duplicate stores for this double engine machinery of which we have 26 sets in operation, many of them by the Government, at the present time.

57,351. Are there any owned by private individuals?—Yes, I have a list of them here. There are fourteen private owners, companies and individuals.

57,352. *Professor Gangulee*: Including tea estates?—Including companies.

57,353. Sugar and tea estates?—Not on tea estates.

57,354. *Mr. Kamat*: Including also the Ruling Princes or big zamindars?—Yes, leaving out all the Government departments who own sets.

57,355. Are the ruling States also excluded from these fourteen?—No, they are included.

57,356. *The Chairman*: What are the indications as to the trade and business in this class of heavy machinery? Is it increasing?—It increased considerably last year with India. In the Central Provinces there was a set delivered early this year with which they are ploughing for hire amongst the cultivators.

57,357. *Sir Henry Lawrence*: Can you give us the Provinces in which these sets are working?—Yes, in the Bombay Presidency they have two sets, both working for hire. The Agricultural Research Institute at Pusa have a set which they use on their own farms entirely for experimental work. I have a report here which has not been copied written by Mr. Musto, who was Agricultural Engineer of the Bombay Presidency, on the work which this machinery has been doing there. This was written in 1913.

57,358. *The Chairman*: Perhaps that is a little out of date for our purposes?—I do not think it is. The figures may be a little out of date, but can be adjusted; but on the other hand the same machinery is at work there to-day.

57,359. *Dr. Hyder*: You were giving the figures: Bombay two, Pusa one?—The Assam Government have a set; that is not one of these. The Central Provinces have one; the Director of Agriculture, Lahore, has one; the Punjab Agricultural College have two, and the Punjab Irrigation Department, Lahore, have one.

57,360. And the rest are in the hands of individuals?—Yes.

57,361. *The Chairman*: You told us you have a system of agencies in India where spare parts are carried?—Our own house.

57,362. One centre?—Bombay and Calcutta, where duplicate parts are carried.

57,363. Are you satisfied with the assistance given you by the agricultural departments?—Yes, we are in very close touch with them; they give us the conditions under which they want machinery to work extraordinarily accurately; but, nevertheless, we always send a man to visit the site where the machinery is to work before supplying it.

57,364. Do you make standard types?—No, all our machinery is made to suit the conditions under which it has to work all over the world.

57,365. So that there is no question of mass production?—None whatever; it is an impossibility.

57,366. Do the Americans make this machinery?—The Americans do not make this class of machinery at all.

57,367. Have you a world wide market?—Yes.

57,368. Australia?—Nearly every country in the world; we have not our own house in Australia at the moment; we closed it two years ago. This system that we mentioned, the hiring system, was started by us in Germany in about 1880. To-day we do not hire any machinery on our own account in Germany, but there are 1,500 sets of steam ploughing tackle of our make on the Continent to-day doing this work.

57,369. Have you any system of easy terms of purchase?—Yes, we give credit to people who are satisfactory, but the terms which we can give are hardly satisfactory to the average cultivator in India. We would be prepared, I think, to consider terms to any contractor who started to do the work and that sort of thing, properly, and we would give every assistance to anybody who wanted to start this work by contracting to the agriculturist.

57,370. What is the price of a typical double set in this country?—The price f.o.b. would be between £4,000 and £6,000 according to the size. There

are several sets in India now thirty years old, still working well. That is one of the reasons why we bring it to your notice; on account of the life of the machinery, it is a thing that can be financed; a thing that lasts a year or two or five years is difficult to finance.

57,371. What life do you give with good treatment?—Thirty years for absolute efficiency without any very heavy repairs; but there are four sets of machinery in Peru, handled by Peruvians, which we supplied in 1869 and 1870, which are still doing good work, and there are forty sets of engines in this country which are over fifty years old still working.

57,372. *Sir James MacKenna*: How many English ploughmen do you keep out in India?—We have five there at the moment, but they are concerned with delivering machinery; they go for six months to deliver each set.

57,373. What import duty do you pay on your machinery into India?—I think it is 2½ per cent.

57,374. That is quite reasonable, is it not?—Yes.

57,375. *Mr. Noyce*: Does not it come under the head of agricultural machinery?—Yes, I was wrong. It is 2½ per cent. on road rollers and nothing on agricultural machinery.

57,376. *Professor Gangulee*: Is is 2½ per cent. on the prime mover?—No, nothing on the agricultural machinery, no duty at all.

57,377. *Sir James MacKenna*: How old is that Pusa set?—I can tell you exactly; it was bought in 1912.

57,378. Was it new when they got it?—Yes, it was delivered in 1912.

57,379. *Professor Gangulee*: To what extent are your machines used for the reclamation of alkali land?—We used a machine in the Punjab for three years; it was perfectly satisfactory, but at the end of the three years the alkali began to rise again in the soil. It should have been washed again, but that was not carried out.

57,380. Who carried out these experiments?—It was done by one of the Government departments, the Punjab Agricultural College.

57,381. After three years' work you say the alkali re-appears?—Yes.

57,382. Do you know what has been done since?—That I do not know. I know they did not re-mole drain the land and wash it again when the alkali reappeared.

57,383. Do you do any business in Egypt?—Yes, tremendous; we have something over two hundred sets in Egypt.

57,384. Did you have any success there in reclamation of alkali lands through the utilisation of your machines?—Nearly all the Delta has been done in the same way. I will not say it has been done with mole drains, but it has been washed by tile drains and other methods of drainage.

57,385. This reclamation work in Egypt was done by your machines?—No; as I say, the drainage methods which were used in the Punjab are not necessarily used in Egypt; some other type of drain is being used, but the washing system has been exactly the same.

57,386. Is the reclamation in Egypt, to which you have just referred, done by Government agencies or by private agencies?—As a rule by private individuals; a lot of it was done when the country belonged to nobody but the Government.

57,387. *Mr. Kamat*: Have you any idea, if the tackle is used on hire by a contractor in India, how much it costs him per acre to plough the land?—That is, of course, entirely according to the conditions; but to plough out *hariali* grass sixteen inches deep he would make a profit doing the work at Rs.25 an acre.

57,388. It is not the hirer's profit I am thinking of, but from the cultivator's point of view, how much will he have to pay?—Rs.25 an acre.

57,389. And supposing *hariali* or *kunda* were uprooted sixteen inches deep, it would never grow again?—No, he can keep his land absolutely clean with

light implements afterwards, with ordinary bullock implements, after it has once been done.

57,390. After it is once eradicated, the land remains in a fairly clean condition?—Yes, provided always that the man is a good cultivator.

57,391. Rs.25 per acre would be the cost of eradicating *hariali* for the ordinary cultivator?—That is a guess on my part, I should like that to be quite clear. I could estimate it for you more closely, but I think Rs.25 should cover all expenses.

57,392. I should be glad if you could give an exact figure later on from the point of view of eradicating the *hariali*, which is a permanent nuisance, as you know?—I can give you a figure for Rajpipla State; that is dated in 1924. The price offered by the cultivator for ploughing practically similar land to *hariali* was Rs.40 an acre; that was what he was ready to offer.

57,393. He was ready to offer Rs.40 if the land was once rid of the grasses?—Yes.

57,394. What about the difficulty of small *bunds* which are put round individual holdings in certain parts of India, especially in view of the fact which you just now told us, that the ordinary unit is about 2,000 acres in England for the proper working of this tackle? You see in India each cultivator has got small holdings, say about ten or twenty or thirty acres, or something like that, and then there is the neighbouring man's land; in between the two is a small *bund*. If the cultivators in a particular village agreed to rid their lands of the *hariali* grass, there would be the difficulty of individual demarcation *bunds* between their holdings; what about the difficulty so far as your tackle is concerned, in view of the fact that you require 2,000 acres, at least, as the smallest unit to work your tackle in?—No, the smallest unit is ten acres in which I can work the tackle. Two thousand acres is the paying proposition; if you have got 2,000 acres on which you can put it to work it is a paying proposition for work of the type generally done in England. For deeper work such as eradicating *hariali* grass, a smaller area, say, 1,000 or 1,500 acres, would keep a set of tackle fully employed.

57,395. You can work it on a ten or twenty acres piece?—Yes. With regard to the *bunds*, are they definite boundaries?

57,396. Yes?—Would it be impossible to re-make those to a small extent?

57,397. That means additional cost and some family disputes?—In China we cannot use steam ploughing tackle because they cannot do anything in a straight line.

57,398. The difficulty I am asking about is that of these demarcation *bunds* which are laid down practically at the end of a settlement between two brothers, for instance, which it is not possible to remove without further trouble; how would your tackle work, even supposing the smallest area were twenty or thirty or forty acres, without disturbing the *bunds*?—With a good deal of trouble, yes.

57,399. That is the difficulty in India?—This big machinery cannot possibly work unless it is worked on a co-operative basis if the cultivators are small, or by a contractor. The cultivator is usually there to see that his land is properly done and that his area is properly ploughed.

57,400. It is not the proper ploughing of the land that is the difficulty: it is the demarcation disputes?—That I could not tell you anything about.

57,401. *Sir Henry Lawrence*: Is there any difficulty in moving your machinery from one area to another?—It is entirely self-contained; it travels on its own wheels and hauls all its own plant. Difficulties with bridges sometimes arise if the canals are very wide; but if the canals are not wide we can usually span them with a 12 by 8 timber and take the engines over that way instead of going over the bridge at all. They move about all parts of the world without very much difficulty.

57,402. They are not liable to be bogged in wet land?—All engines are liable to bog in wet land if it is very wet, but we can travel under any reasonable conditions.

57,403. They are not too heavy for the culverts on the small rural roads? —No, we have a big width of wheel, which spreads the load very considerably; naturally we have to have that for travelling over the land when we go off the road, and therefore when you come to culverts your spread allows you to travel over them without doing damage.

57,404. *Sir Thomas Middleton*: Do you collect costs of working from your house in India?—Yes, we try to get them from all the owners of our machinery, but they do not all keep them very accurately, I am afraid.

57,405. The figure you gave to Mr. Kamat was a rough estimate of Rs.25? —That is, I think, a figure on which we should be prepared to contract if somebody put us up a proposition to do it.

57,406. Was that based on examining the reports that have come to you on the actual cost?—Yes.

57,407. Are you furnished regularly with reports as to the working of your machines from the separate Provinces? I am thinking now of the Central Provinces. Have you had any report from the Central Provinces recently?—We have had reports through our Bombay house, yes, but so far the reports have been very meagre; they have not said a great deal about it.

57,408. Do you know whether they are attempting to eradicate *kans* in the Central Provinces?—Yes, they are; that is what the machinery is there for.

57,409. Can you tell us what success they have met with?—There has not really been time; it has only started in the beginning of this year; you could not tell whether the *kans* has actually been eradicated or not.

57,410. *Sir Henry Lawrence*: They had some machines working some time ago in the Dharwar region of Bombay?—Yes, that was the Bombay Presidency test.

57,411. Are they still working?—Yes.

57,412. And popular with the ryot?—Apparently very; the Government wanted to send one to Mesopotamia, and the ryots would not let it go. That is a fact.

57,413. That particular instance occurred in the Dharwar District?—Yes.

57,414. *Sir Thomas Middleton*: Is there any district other than the Central Provinces where they are using your machinery to eradicate *kans*? —No; the machinery, I think, is only being used for that particular weed in the Central Provinces; it is being used for *kunda* grass and for *hariali* grass in the other Provinces. Lahore are using another set for drainage now; it went out this year.

57,415. You have no machines in the Bhopal State or elsewhere north of the Central Provinces?—I do not think so.

57,416. *Dr. Hyder*: What is this process of mole drainage?—I think perhaps I could illustrate that better by these photographs. (*Handing a number of photographs to Dr. Hyder.*)

57,417. Are your ploughs and steam tackle of use in clearing land?—Yes, undoubtedly; if it is small jungle scrub you can clear land quite satisfactorily with the ploughing engines that are used on the double engine cable system.

57,418. When large areas for colonisation under irrigation schemes are taken up, do you approach the different Governments in India with a view to their buying your machinery, have land for colonisation cleared of scrub and levelled, and then give it to the cultivators to take up?—I do not know how far the Indian Government have been approached by our Bombay department.

57,419. Take the Sukkur Barrage scheme; they will have to level that and clear it of scrub?—We have approached the Government of India about that.

57,420. Do you think there is scope for the employment of your machinery? —Undoubtedly. We make a special engine which pulls a tree down complete and pulls the roots clean out of the ground.

57,421. *Mr. Noyce*: Your machinery is distinctly expensive for Indian agricultural conditions, is it not?—It is expensive in first cost.

57,422. The point that occurs to one is that the only way to recommend it to intending purchasers is by obtaining the fullest information in regard to the cost of working and the way in which the machinery works under Indian conditions. Have you thought of compiling a fairly exhaustive report on that aspect?—Yes. There are reports here which are issued by the Government of India from Pusa with regard to our machinery. There is a further report here from Bombay and Dharwar.

57,423. I mean a report that you, for instance, could now hand over to this Commission and say: This is the result of 30 years' experience with our machinery in India, there are the costs and that is what it has done?—A report entitled "Mechanical cultivation in India" has already been handed in by our Indian branch. This is a copy. (*Handing same to Mr. Noyce.*) I think you will find the costs are stated there. That has been handed in in India to this Commission.

57,424. It would be worth while having that printed?—Yes. As a matter of fact it is so very difficult to give an idea of the cost of doing work in India or in any other country until you are actually given the conditions under which you have got to work. Somebody may afterwards say to you: You say in such and such a booklet that you can do this at five rupees an acre; but it may be that his conditions make it that you cannot work for less than twenty-five rupees. Therefore it is extraordinarily difficult to give anybody any idea of what it is going to cost without seeing the land yourself.

57,425. Can you, when you see the land yourself, give a fairly accurate estimate of what it will cost to work it?—I can; I have travelled all over the world doing it.

57,426. Can your people in India?—Undoubtedly yes.

(*The witness withdrew.*)

Mr. G. A. JULIUS,

(Chairman, Australian Commonwealth Council for Scientific and Industrial Research).

AGRICULTURAL ADMINISTRATION IN AUSTRALIA.

(*Note prepared in* 1926 *in the office of the High Commissioner for Australia in London.*)

1. In the matter of agricultural legislation and administration in Australia each State is practically independent. The Federal Government exercises no control except in the matter of quarantine of animals, plants, etc., brought into Australia from any place outside the Commonwealth. In regard to inter-state movements of animals and plants the Quarantine Act, which is administered by the Commonwealth Government Department of Health, becomes operative only if the Governor-General be of opinion that Federal action is necessary for the protection of any State or States; in the meantime the administration of inter-state quarantine of animals and plants is left in the hands of the States. The Commonwealth possesses stations in each State for the purposes of human and also of animal quarantine.

2. Finance follows authority, being provided by the respective State Governments, except for the administration of the Quarantine Act, which is provided by the Federal Government.

3. In the matter of agricultural research the States are also independent. Each State has its Department of Agriculture, controlled by a Minister. With a view to co-ordinating agriculture and other research in Australia, the Federal Government in 1920 passed The Institute of Science and Industry Act under which the Commonwealth Institute of Science and Industry was established. The powers and functions of the Institute are set out in the Act, a copy of which is attached. A Director (Sir G. H. Knibbs) a Provisional General Advisory Council and Provisional State Advisory Boards were subsequently appointed. The State Governments are represented on the State Advisory Councils by the Minister for Agriculture. Owing to the limited vote available, the functions of the Institute have been restricted, but it has undertaken a considerable amount of agricultural research work, the result of which has been published in the Bulletin issued by the Institute from time to time.

In research work the Institute's investigators have the active co-operation of the State agricultural experts.

The Institute is now being reconstituted and last year, on the invitation of the Prime Minister, Sir Frank Heath, of the Department of Scientific and Industrial Research, visited Australia and made recommendations for the reconstruction of the Institute.

As a result a bill was introduced in the Federal Parliament on 28th May 1926, which provides for the reconstitution of the Institute along the lines suggested by Sir Frank Heath.

Sir Frank recommended that the reorganised Institute should be constituted as follows:—

(*a*) A responsible Minister.

(*b*) An Advisory Council consisting of a Chairman and eight members, with an Executive Committee consisting of the Chairman and two members.

(*c*) An Advisory Committee in each State, two members to be nominated by the State Government, two representatives of the State University and two representatives of the principal industries.

Sir Frank Heath also recommended that there should be established *inter alia*, under the charge of special scientific officers, an Agricultural Section, attached to which there shall be in the first instance a Dairy Research Institute.

Details of the bill now before Parliament are not yet available, but according to cable advices, a sum of £250,000 is provided for scientific and industrial investigations and £100,000 for an endowment fund to enable research students to be trained abroad.

4. Apart from this latter arrangement, agricultural education in Australia is entirely a State matter. State Agricultural Colleges under Government control are established in each State.

Note of Evidence.

I.—Position Before Establishment of the Commonwealth Council for Scientific and Industrial Research.

(a) *Relations between Commonwealth and State Governments.*

In the constitutional relations between the Commonwealth and State Governments of Australia, the development and supervision of all land within State boundaries is the concern of the State Governments.

Mr. G. A. Julius.

(b) *Agricultural organization in the States.*

Departments of Agriculture.—Each of the six States of Australia maintains a Department of Agriculture, the functions of which are devoted mainly to educational, demonstrational, and extension work, and to the administration of various Acts of Parliament affecting agriculture. A limited amount of research work is also carried out by the larger departments.

Associated with the New South Wales, Victorian, and South Australian Departments of Agriculture, there are a number of research and demonstration farms. These include Glenfield Research Station (in New South Wales), and the Werribee Research Farm (in Victoria). Under the control of these departments, there are also agricultural training colleges, the chief of which are Hawkesbury College (in New South Wales), Dookie College (in Victoria), and Roseworthy College (in South Australia).

The propaganda and demonstrational work of the departments is effected mainly through experimental farms.

The Universities.—Sydney, Melbourne, and Perth have, within their respective Universities, Schools of Agriculture in which teaching and research work are carried out. In Adelaide, there is attached to the University a special research organization—the Waite Agricultural Research Institute—at which the whole of the staff concentrates on research work, and are free from all teaching duties.

(c) *Position of Research in Departments of Agriculture.*

It has become apparent that because of the large amount of attention necessarily given to demonstrational, extension, and administrative work by the officers of the State departments, fundamental research has been forced into the background. Although the staffs of the departments consist in most cases of thoroughly competent men, it has therefore so far been impossible to include much necessary fundamental work in the programme of departmental activities.

Further, it has been inevitable that overlapping has caused a serious waste of effort, and the energies of investigators, considered nationally, have not always been used to the best advantage.

For these two main reasons it became apparent that there was a definite need for a national body, equipped with experts of the highest standing, whose energies should be devoted to the correlation of work carried out by the States, and to the planning and execution of such fundamental work as is necessary within the Commonwealth. It was evident, too, that the functions of the national body of experts should be to keep in the closest and most sympathetic touch with the State departments, and to try to assist those departments to divide up the investigational work in such a manner as would utilise the limited number of fully qualified investigators to the fullest advantage. A further benefit to be derived from the organisation of the attack on scientific problems on a national basis is that the application of results should thus prove to be more effective than if such work were undertaken independently in the six States.

II.—The Genesis of the Commonwealth Council for Scientific and Industrial Research.

At the outset certain grave difficulties confronted the setting up of the Commonwealth Council. One of the greatest was the suspicion held in various States that the Council was seeking to usurp State functions, and that discouragement would be offered to the efforts of the States in attempting to build up their own scientific research organization. The

attempts to develop the earlier Commonwealth Institute of Science and Industry which had been made during the ten to twelve years prior to the establishment of the Commonwealth Council, had been seriously handicapped, largely through the failure to secure State sympathy and co-operation. The result was that the members of the Federal Parliament representing constituencies situated in different States were not interested, and the Institute was starved financially.

The Commonwealth Government, when reorganizing the former Institute of Science and Industry into the new Commonwealth Council for Scientific and Industrial Research, laid it down as axiomatic that, before the initiation of any new Commonwealth establishment for research purposes, no effort was to be spared to utilise to the fullest extent existing State organization and establishments. (During the past twelve months the activities of the Commonwealth Council have proceeded entirely along these lines.)

(A) *Constitution of the Commonwealth Council for Scientific and Industrial Research.*

Under the Science and Industry Research Act, 1926, provision is made for a Council consisting of:—

(*a*) Three members nominated by the Commonwealth Government.

(*b*) The Chairman of each State Committee constituted under the Act.

(*c*) Such other members as the Council, with the consent of the Minister, co-opts by reason of their scientific knowledge.

(1) The three Commonwealth nominees form an *Executive Committee* which may exercise between meetings of the Council all the powers and functions of the Council.

(2) *The Commonwealth Council* consists, as stated above, of the three members of the Executive Committee, the Chairmen of the State Committees, and of such other members as are co-opted by reason of their scientific knowledge.

(3) *The State Committees* consist of the following:—

(*a*) Chairmen selected by the Commonwealth Government after consultation with the State authorities.

(*b*) Three members appointed by the State Governments from the staffs of their scientific departments.

(*c*) Three members representative of pure science, of which at least two must be from the local University—all three to be selected by the National Research Council.

(*d*) Three (or in exceptional circumstances, more) other members co-opted by the Chairman and representative of primary and secondary industries within the State.

(4) *Sub-Committees* on special subjects are appointed from time to time as desired.

(B) *The Activities of the Commonwealth Council for Scientific and Industrial Research.*

From many sources, evidence has been afforded that the confidence and co-operation of scientific institutions in the States have been fully secured. Under these conditions, investigations in many directions have been started.

The first efforts of the Commonwealth Council have been largely directed towards the stimulation of the investigational work of the States. When, however, problems arise that are unsuited for investigation by any particular State, it is the function of the Commonwealth Council to take over such work.

The experience gained in the last twelve months has emphasised two facts:—

(1) That there is a definite need for a group of co-ordinating experts in order to obtain the maximum efficiency from the various groups of investigators in the States:

(2) That there are a large number of fundamental problems with which it is abundantly clear the State departments of agriculture are unable to deal, at present at least. In many cases the problems are long dated and, needing as they do the intense and entire attention of very competent investigators, the men in the State departments have not the opportunity to engage on such problems. (If desired, a verbal statement of the present activities of the Council can be given.)

III.—Co-operation in Agricultural Research in Australia.

An agricultural conference was convened in March, 1927, by the Commonwealth Council for Scientific and Industrial Research, and with the concurrence of the State departments of agriculture, was attended by the permanent heads and other officers of these departments; the Professors of Agriculture of the various Australian Universities were also present.

At this conference, a definite scheme was planned setting out broadly the directions in which the Commonwealth or national organization should develop. The main features of the resolutions passed at this conference are as follows:—

(1) That Commonwealth participation in agricultural research is desirable.

(2) That problems which are national in scope and fundamental in character, and which require concentration of effort and highly specialised research for their solution, are specially suited for investigation by the Commonwealth.

(3) That the Commonwealth Council for Scientific and Industrial Research could render great service by the Agricultural Institutions of the Commonwealth by acting as a clearing house for information on research projects in progress in State Institutions and Universities. There should be an interchange of scientific (research) information between the States and the Commonwealth.

(4) That the Commonwealth could render a service to Australian agriculture by issuing a journal of Australian scientific research which should include papers on agricultural science which are too technical for the departmental journals, and yet are not of sufficient international importance to justify inclusion in scientific journals abroad.

(5) That the Council should adopt a scheme which will enable the Universities to attract students to the Faculties of Agriculture and of Veterinary Science by notifying that appointments will be available for suitably trained men.

(6) That the ways in which the Commonwealth Council can best serve Australia in its agricultural development are by co-operation and collaboration with State departments of agriculture, with the Universities,

and with the institutions concerned with agricultural and livestock interests.

"It is understood that such co-operation would be compatible with the independence of individual organizations undertaking research activities."

(7) To effect the desirable co-operation and necessary collaboration, it is considered that the Council should bring into existence a Standing Committee on Agriculture, comprising the permanent heads of the State departments of agriculture, and representatives of the Council, such Standing Committee on Agriculture to act as the advisory and consultative body on matters relative to agricultural and livestock research undertaken by the Commonwealth.

(8) The research problem confronting the agricultural and livestock industries may be classified broadly into these categories:—

(i) Investigation of principles underlying the practice of farming and the rearing and feeding of stock.

(ii) The production of new varieties or breeds of plants and animals.

(iii) The investigation of diseases of plants and animals with a view to control.

(The conference has indicated the special phases of these problems which should be investigated either by the States or by the Commonwealth body.)

(iv) *Co-operative Agricultural Research in the Empire.*—The Commonwealth Council considers that there is a definite need for co-operation and collaboration within the Empire, and that this need is parallel to that which exists between the States and the Commonwealth Government of Australia.

(a) *Location of Research Stations.*

In any scheme of collaboration in research work between the various parts of the Empire, the Council considers it of paramount importance that the location of researches on particular problems must be determined only after the most careful consideration has been given to every factor concerning the position and conditions obtaining in the different parts of the Empire. In this connection, the proposal for the formation of a tropical agricultural research institute in Northern Australia is of interest.

It is largely for this reason that the Council welcomed the suggestion of the Ministry of Agriculture for the holding of an Imperial Agricultural Conference, at which there will be an opportunity for the discussion of this and other matters affecting agriculture within the Empire.

(b) *Training of Research Workers.*

Not only throughout Australia, but also throughout the Empire, there appears to be a serious shortage of trained men for agricultural research work. This position, we consider, necessitates a judicial distribution of research problems in order to avoid unnecessary duplication of effort, and to utilise to the fullest advantage the limited scientific man-power at the disposal of agricultural research within the Empire.

APPENDIX I.

THE COMMONWEALTH OF AUSTRALIA.

INSTITUTE OF SCIENCE AND INDUSTRY.

No. 22 of 1920.

AN ACT RELATING TO THE COMMONWEALTH INSTITUTE OF SCIENCE AND INDUSTRY.

[Assented to 14th September, 1920.

BE it enacted by the King's Most Excellent Majesty, the Senate, and the House of Representatives of the Commonwealth of Australia, as follows:—

PART I.—PRELIMINARY.

Short title.

1. This Act may be cited as the *Institute of Science and Industry Act*, 1920.

Parts.

2. This Act is divided into Parts as follows:—

Part I.—Preliminary.

Part II.—The Commonwealth Institute of Science and Industry.

Part III.—Powers and Functions of the Director.

Part IV.—Miscellaneous.

Definition.

3. In this Act, unless the contrary intention appears—

"Institute" means the Commonwealth Institute of Science and Industry;

"Officer" means any person employed by the Director under this Act;

"The Director" means the Director of the Commonwealth Institute of Science and Industry.

PART II.—THE COMMONWEALTH INSTITUTE OF SCIENCE AND INDUSTRY.

The Institute of Science and Industry.

4.—(1) There shall be a Commonwealth Institute of Science and Industry, consisting of the Director, which shall be a body corporate with perpetual succession and a common seal and capable of suing and being sued.

(2) All Courts, Judges and persons acting judicially shall take judicial notice of the seal of the Institute affixed to any document or notice, and shall presume that it was duly affixed.

(3) The Institute shall, subject to this Act, have power to hold lands, tenements and hereditaments, goods, chattels and any other property for the purpose of and subject to this Act.

(4) The Institute shall have power to acquire by gift, grant, bequest or devise, any such property for the purposes of this Act, and, in the absolute discretion of the Director, to agree to any conditions of such gift. grant, bequest or devise.

(5) The powers of the Institute under the last preceding sub-section shall, subject to the regulations and the approval of the Minister, be exercised by the Director on behalf of the Institute.

Constitution of Institute.

5. The Institute shall establish—

(*a*) a Bureau of Agriculture;

(*b*) a Bureau of Industries; and

(*c*) such other bureaux as the Governor-General determines.

Appointment of Advisory Council and Boards.

6. The Governor-General may appoint a General Advisory Council and Advisory Boards in each State to advise the Director with regard to—

(*a*) the general business of the Institute or any bureau thereof; and

(*b*) any particular matter of investigation or research.

Appointment of Director.

7.—(1) The Governor-General may appoint a Director of the Institute.

(2) On the happening of any vacancy in the office of Director of the Institute the Governor-General may appoint a person to the vacant office.

(3) The term for which such appointment is made shall be five years, and any person so appointed shall, at the expiration of the term of office, be eligible for re-appointment.

(4) In case of the illness, suspension or absence of the Director, the Governor-General may appoint a person to act as Deputy-Director during the illness, suspension or absence, and the Deputy shall, while so acting, have all the powers and perform all the duties of the Director.

Salary and expenses of the Director.

8.—(1) The Director shall receive such salary as the Governor-General determines.

(2) The salary of the Director shall be paid out of moneys appropriated by Parliament for the purpose.

(3) Travelling expenses as prescribed shall be paid to the Director on account of his expenses in travelling in the discharge of the duties of his office.

Suspension of Director.

9.—(1) The Governor-General may at any time suspend the Director from his office for incapacity, incompetence, or misbehaviour.

(2) The Minister shall, within seven days after the suspension, if the Parliament is then sitting, or if the Parliament is not then sitting, within seven days after the next meeting of the Parliament, cause to be laid before both Houses of Parliament a full statement of the grounds of suspension.

(3) A Director who has been suspended shall be restored to office unless each House of Parliament within forty days after the statement has been laid before it, and in the same session, passes an address praying for his removal on the grounds of proved incapacity, incompetence or misbehaviour.

Director to devote whole time to his duties.

10. The Director shall devote the whole of his time to the performance of his duties, and shall not accept or hold any paid employment outside the duties of his office as Director or be a director of a company.

Part III.—Powers and Functions of the Director.

Powers and functions of Director.

11. The powers and functions of the Director shall, subject to the regulations and to the directions of the Minister, be—

(*a*) the initiation and carrying out of scientific researches in connexion with, or for the promotion of, primary or secondary industries in the Commonwealth;

(*b*) the establishment and awarding of industrial research studentships and fellowships;

(*c*) the making of grants in aid of pure scientific research;

(*d*) the recognition or establishment of associations of persons engaged in any industry or industries for the purpose of carrying out industrial scientific research and the co-operation with and the making of grants to such associations when recognised or established;

(*e*) the testing and standardisation of scientific apparatus and instruments, and of apparatus, machinery, materials and instruments used in industry;

(*f*) the establishment of a Bureau of Information for the collection and dissemination of information relating to scientific and technical matters; and

(*g*) the collection and dissemination of information regarding industrial welfare and questions relating to the improvement of industrial conditions.

12. The Director shall, as far as possible, co-operate with the existing State organisation in the co-ordination of scientific investigation, with a view to—

(*a*) the prevention of unnecessary overlapping; and

(*b*) the utilisation of facilities and staffs available in the States.

Part IV.—Miscellaneous.

Arrangements with States.

13. The Governor-General may arrange with the Governor of any State for any of the following purposes:—

(*a*) the utilisation for the purposes of this Act of State Research Departments and Laboratories and Experimental Stations and Farms;

(*b*) the co-operation in industrial and scientific research with State Government Departments, Universities and Technical Schools; and

(*c*) the co-operation with educational authorities and scientific societies in the Commonwealth with a view to—

(i) advancing the teaching of science in schools, technical colleges and universities where the teaching is determined by those authorities;

(ii) the training of investigators in pure and applied science, and of techical experts; and

(iii) the training and education of craftsmen and skilled artisans.

Appointment of Officers.

14.—(1) The Governor-General may, on the recommendation of the Minister, appoint such officers as he thinks necessary for the purposes of this Act.

(2) Officers employed under this Act shall not be subject to the *Commonwealth Public Service Act*, 1902-1918, but shall be engaged for such periods and shall be subject to such conditions as are prescribed.

(3) An officer of the Commonwealth Public Service or of the Public Service of a State who becomes an officer under this Act shall retain all his existing and accruing rights.

Discoveries by Officers.

15. All discoveries, inventions and improvements in processes, apparatus and machines made by officers of the Institute shall be vested in the Institute as its sole property, and shall be made available under such conditions and payment of such fees or royalties or otherwise as the Governor-General determines.

Bonuses for discoveries by Officers.

16.—(1) The Director may pay to successful discoverers or inventors working as officers of the Institute or under the auspices of the Institute such bonuses as the Governor-General determines.

(2) Bonuses payable under this section shall be paid out of moneys appropriated by Parliament for the purpose.

Fees and agreements for special investigations.

17. The Director may charge such fees and may agree to such conditions as he thinks fit for special investigations carried out at the request of any authority, institution, association, firm or person.

Annual report of Director.

18. The Director shall, once in every year, make a report to the Minister containing a summary of the work done and researches and investigations made and proceedings taken by the Institute during the preceding year.

Reports to be presented to Parliament.

19. The Minister shall cause the yearly report of the Director to be laid before both Houses of the Parliament within thirty days after the receipt thereof if the Parliament is then sitting, and if not, within thirty days after the next meeting of the Parliament.

Power to publish information.

20. The Director may publish such information relating to any matter investigated by him as he thinks fit, except where such publication would be contrary to conditions agreed to under section seventeen hereof.

Regulations.

21. The Governor-General may make regulations not inconsistent with this Act, prescribing all matters which are required or permitted to be prescribed or which are necessary or convenient to be prescibed for carrying out or giving effect to this Act, and in particular for prescibing such additional powers and duties of the Director as he deems desirable.

APPENDIX II.

THE COMMONWEALTH OF AUSTRALIA.

SCIENCE AND INDUSTRY RESEARCH.

No. 20 of 1926.

AN ACT TO AMEND THE INSTITUTE OF SCIENCE AND INDUSTRY ACT, 1920.

[Assented to 21st June, 1926.

BE it enacted by the King's Most Excellent Majesty, the Senate, and the House of Representatives of the Commonwealth of Australia, as follows:—

Short title and citation.

1.—(1) This Act may be cited as the Science and Industry Research Act, 1926.

(2) The Institute of Science and Industry Act, 1920, is in this Act referred to as the Principal Act.

(3) The Principal Act, as amended by this Act, may be cited as the Science and Industry Research Act, 1920-1926.

Parts.

2. Section two of the Principal Act is amended—

(a) by omitting the words "Institute of Science and Industry" and inserting in their stead the words "Council for Scientific and Industrial Research";

(b) by omitting the word "Director" and inserting in its stead the word "Council"; and

(c) by inserting before the words "Part IV.—Miscellaneous." the words "Part IIIA.—State Committees.".

3. Section three of the Principal Act is amended— Definitions

(*a*) by omitting the definition of "Institute";

(*b*) by omitting from the definition of "Officer" the words "by the Director";

(*c*) by inserting after the definition of "Officer" the following definition:—

"'The Council' means the Commonwealth Council for Scientific and Industrial Research."; and

(*d*) by omitting the definition of "The Director".

4. Part II, consisting of sections four to ten inclusive, of the Principal Act is repealed and the following Part and sections inserted in its stead:—

"PART II.—THE COMMONWEALTH COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

"4.—(1) There shall be a Commonwealth Council for Scientific and Industrial Research, which shall be a body corporate with perpetual succession and a common seal and capable of suing and being sued. Council for Scientific and Industrial Research.

"(2) All Courts, Judges and persons acting judicially shall take judicial notice of the seal of the Council affixed to any document or notice, and shall presume that it was duly affixed.

"(3) The Council shall, subject to this Act, have power to hold lands, tenements and hereditaments, goods, chattels and any other property for the purpose of and subject to this Act.

"(4) The Council shall have power to acquire by gift, grant, bequest or devise, any such property for the purposes of this Act, and to agree to any conditions of such gift, grant, bequest or devise.

"(5) The powers of the Council under the last preceding sub-section shall be exercised subject to the regulations and the approval of the Minister.

"(6) Any property which was, immediately prior to the commencement of this section, vested in the Commonwealth Institute of Science and Industry shall, upon that commencement, become vested in the Council.

"5.—(1) The Council shall consist of the following members:— Membership of Council.

(*a*) three members nominated by the Minister and appointed by the Governor-General, one of whom the Governor-General shall appoint to be Chairman of the Council;

(*b*) the Chairman of each State Committee constituted under this Act; and

(*c*) such other members as the Council, with the consent of the Minister, co-opts by reason of their scientific knowledge.

"(2) The members appointed by the Governor-General on the nomination of the Minister shall hold office for a period not exceeding five years and shall be eligible for re-appointment.

"(3) A member co-opted in pursuance of paragraph (*c*) of sub-section (1) of this section shall hold office for the period specified at the time of his co-option.

"6.—(1) The Council shall meet at such times and places as the Minister determines. Meetings of the Council.

"(2) Five members of the Council shall constitute a quorum for the transaction of the business of the Council.

"7.—(1) The Chairman and other members of the Council shall receive such remuneration and expenses as are fixed by the Governor-General. Remuneration.

"(2) The Consolidated Revenue Fund is, to the extent necessary to provide for payment of the remuneration of members of the Council, hereby appropriated accordingly.

Executive Committee of the Council.

"8.—(1) There shall be an Executive Committee of the Council consisting of the members of the Council appointed by the Governor-General on the nomination of the Minister.

"(2) The Executive Committee shall have and may exercise, between meetings of the Council, all the powers and functions of the Council.

Casual vacancies in Council.

"9. Upon the death or retirement of any member of the Council during his term of office:—

(*a*) in the case of a member appointed by the Governor-General on the nomination of the Minister—the Governor-General may on the like nomination appoint a person to hold the vacant office until the expiration of the term of the member who has died or retired; and

(*b*) in the case of any other member—the deputy Chairman (if any) of the State Committee shall hold the vacant office until the appointment of a Chairman of that Committee.

Deputies of Members.

"10. In case of the illness, suspension or absence of a member of the Council the Governor-General may appoint a person to act as the deputy of the member during his illness, suspension or absence, and the deputy shall, while so acting, have and may exercise all the powers and functions of the member.

Suspension of Members.

"10A. The Governor-General may at any time remove a member of the Council from his office for proved misbehaviour or incapacity.

Amendment of heading to Part III.

5. The heading to Part III of the Principal Act is amended by omitting the word "Director" and inserting in its stead the word "Council".

Powers and functions of Council.

6. Section eleven of the Principal Act is amended—

(*a*) by omitting the words "The powers and functions of the Director shall, subject to the regulations and to the directions of the Minister, be—" and inserting in their stead the following words:—

"(1) The Council may make recommendations to the Minister as to:—

(*a*) its policy and work;

(*b*) the funds required for carrying out the work of the Council; and

(*c*) the allocation of funds made available for carrying out that work.

"(2) The powers and functions of the Council shall, subject to the regulations and to the approval of the Minister, be—";

(*b*) by inserting in paragraph (*b*) before the words "the establishment" the words "the training of research workers and";

(*c*) by inserting in paragraph (*e*) after the words "instruments, and" the words "the carrying out of scientific investigations connected with standardization";

(*d*) by omitting from paragraph (*f*) the word "and" (last occurring); and

(*e*) by omitting paragraph (*g*) and inserting in its stead the following words:—

"and also that of acting as a means of liaison between the Commonwealth and other countries in matters of scientific research.".

Co-operation with State organizations.

7. Section twelve of the Principal Act is amended by omitting the word "Director" and inserting in its stead the word "Council".

8. After Part III the following Part and sections are inserted:—

"PART IIIA.—STATE COMMITTEES.

Appointment of State Committees.

"12A.—(1) The Governor-General may appoint a State Committee in each State consisting of such number of members as is prescribed.

"(2) The terms of the appointment of members and the method of appointment of the Chairman of each State Committee shall be as prescribed.

Function of State Committees.

"12B. The function of each State Committee shall be to advise the Council with regard to:—

(a) the general business of the Council; and

(b) any particular matter of investigation and research.".

9. Section fourteen of the Principal Act is repealed and the following sections inserted in its stead:—

Investigators and Committees of Investigation.

"14.—(1) The Council may, with the approval of the Minister, appoint such Investigators and Committees of Investigation as it deems necessary for the purposes of this Act.

"(2) Investigators and Committees of Investigation shall be appointed upon such terms and conditions as are approved by the Minister.

Appointment of Officers.

"14A.—(1) The Council may, with the approval of the Minister, appoint such officers as it thinks necessary for the purposes of this Act.

"(2) Officers employed under this Act shall not be subject to the *Commonwealth Public Service Act*, 1922-1924, but shall be engaged for such periods and shall be subject to such conditions as are prescribed.

"(3) An officer of the Commonwealth Public Service or of the Public Service of a State who becomes an officer under this Act shall retain all his existing and accruing rights.

"(4) An officer appointed under this Act shall be deemed to be an 'employee' within the meaning of section four of the *Superannuation Act*, 1922-1924, unless the Council, at the time of the appointment of the officer, notifies him in writing that he is not to be deemed such an employee."

Discoveries by officers.

10. Section fifteen of the Principal Act is amended by omitting the word "Institute" (wherever occurring) and inserting in its stead the word "Council."

Bonuses for discoveries by officers.

11. Section sixteen of the Principal Act is amended—

(a) by omitting the word "Director" and inserting in its stead the word "Council"; and

(b) by omitting the word "Institute" (wherever occurring) and inserting in its stead the word "Council."

Fees and agreements for special investigations.

12. Section seventeen of the Principal Act is amended—

(a) by omitting the word "Director" and inserting in its stead the word "Council"; and

(b) by omitting the word "he" and inserting in its stead the word "it."

13. After section seventeen of the Principal Act the following sections are inserted:—

Appropriation for investigations.

"17A. For the purposes of scientific and industrial investigations carried out in pursuance of this Act there is hereby appropriated from the Consolidated Revenue Fund the sum of two hundred and fifty thousand pounds.

Trust Account.

"17B.—(1) The amount appropriated by the last preceding section shall be paid into and form part of a Trust Account to be known as the Science and Industry Investigation Trust Account.

"(2) The Trust Account established by this section shall be a Trust Account within the meaning of section sixty-two A of the *Audit Act*, 1901-1924.

"(3) No money shall be expended from the Trust Account established by this section except in accordance with estimates of expenditure which have been passed by both Houses of the Parliament."

Annual report of Council.

14. Section eighteen of the Principal Act is amended—

(*a*) by omitting the word "Director" and inserting in its stead the word "Council"; and

(*b*) by omitting the word "Institute" and inserting in its stead the word "Council."

Reports to be presented to Parliament.

15. Section nineteen of the Principal Act is amended by omitting the word "Director" and inserting in its stead the word "Council."

Power to publish information.

16. Section twenty of the Principal Act is amended—

(*a*) by omitting the word "Director" and inserting in its stead the word "Council"; and

(*b*) by omitting the words "him as he" and inserting in their stead the words "it as it."

Regulations.

17. Section twenty-one of the Principal Act is amended by omitting the word "Director" and inserting in its stead the word "Council."

APPENDIX III.

THE COMMONWEALTH OF AUSTRALIA.

SCIENCE AND INDUSTRY ENDOWMENT.

No. 21 of 1926.

AN ACT TO CONSTITUTE A FUND TO BE UTILIZED FOR THE PURPOSES OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

[Assented to 21st June, 1926.]

BE it enacted by the King's Most Excellent Majesty, the Senate, and the House of Representatives of the Commonwealth of Australia, as follows: —

1. This Act may be cited as the *Science and Industry Endowment Act*, 1926. Short title.

2. In this Act, unless the contrary intention appears, "the Fund" means the Fund established by this Act. Definition.

3. For the purposes of this Act there is hereby appropriated out of the Consolidated Revenue Fund the sum of One hundred thousand pounds. Appropriation.

4.—(1) A Fund is hereby established which shall be known as the Science and Industry Endowment Fund. The Fund.

(2) The Fund shall consist of—

(*a*) the amount appropriated by this Act and of income derived from the investment of that amount or any part thereof; and

(*b*) gifts or bequests given or made for the purposes of the Fund and the income derived from or proceeds of the realization of the property so given or devised.

5. The Fund shall be vested in and placed under the control of the trustees appointed by this Act. Control of Fund.

6. The members for the time being of the Executive Committee of the Commonwealth Council for Scientific and Industrial Research appointed under the *Science and Industry Research Act*, 1920-1926, shall be the trustees of the Fund. Trustees of the Fund.

7. So much of the capital of the Fund as represents the amount appropriated by this Act shall, and any income derived from the investment of that capital which is not immediately required for the purposes of this Act may, be invested by the trustees in securities of the Commonwealth or of the States or in any other manner for the time being allowed by any Act or State Act for the investment of trust funds in Australia. Investment of Fund.

8.—(1) The income derived from the investment of so much of the Fund as represents the amount appropriated by this Act shall be applied to provide assistance— Application of Fund.

(*a*) to persons engaged in scientific research; and

(*b*) in the training of students in scientific research.

(2) Assistance provided under the last preceding sub-section shall be provided in such cases and subject to such conditions as the trustees determine.

Application of gifts or bequests.

9. The trustees shall deal with and apply so much of the Fund as represents gifts or bequests or the income arising from the investment thereof in accordance with the conditions upon which the gift or bequest was given or made, or, where no conditions are attached to a gift or bequest, shall deal with and apply so much of the Fund as represents that gift or bequest, in the manner provided by sections seven and eight of this Act.

Audit of Accounts.

10.—(1) The accounts of the Fund shall be audited from time to time by the Auditor-General for the Commonwealth.

(2) A report of each audit shall be made to the Treasurer who shall cause a copy of the Report to be laid on the table of each House of the Parliament.

APPENDIX IV.

STATUTORY RULES, 1926. No. 125.

(With Amendments of Statutory Rules, 1927, No. 38, incorporated in *italics*.)

REGULATIONS UNDER THE SCIENCE AND INDUSTRY RESEARCH ACT, 1920-1926.

Short title.

1. These Regulations may be cited as the Science and Industry Research Regulations.

Definition.

2. In these Regulations, unless the contrary intention appears, "the Act" means the *Science and Industry Research Act*, 1920-1926, as amended from time to time.

Constitution of State Committees and terms of appointment.

3.—(1) A State Committee shall consist of a Chairman and not more than fifteen members, exclusive of *ex-officio* members.

(2) The Chairman shall be appointed by the Governor-General on the nomination of the Minister.

(3) The State Government shall have the right of nominating three members from the staffs of its Scientific Departments.

(4) The Australian National Research Council shall have the right of nominating three members, eminent in science, of whom at least two shall be members of the staff of the University in the State.

(5) The Chairman and such members as may have been nominated under sub-regulations (3) and (4) of this regulation shall have the right of nominating three members associated with industry.

(6) A State Committee, with the consent of the Executive Committee of the Council for Scientific and Industrial Research, may co-opt further members, not exceeding six, by reason of their special qualifications.

(7) Members of the Executive Committee shall be *ex-officio* members of all State Committees.

(8) Co-opted members of the Council shall be *ex-officio* members of the State Committees of the States in which they reside.

9. Members of the State Committees, when travelling on the business of the Council, shall be paid the cost of their conveyance, together with an allowance at the rate of two guineas per day.

Salaries and periods of appointment of officers.

4.—(1) *Subject to these regulations*, officers employed under the Act shall be engaged for such periods and shall be paid such salaries *and allowances and shall be subject to such conditions* as the Council, with the approval of the Minister, determines.

(2) All officers employed under the Act shall hold office subject to good behaviour and compliance with these Regulations.

Increments.

5. Where the terms of appointment of an officer do not provide for the payment of increments, such increments may be paid, subject to the necessary appropriation by Parliament, as the Council, with the approval of the Minister, determines.

Applications of Commonwealth Public Service Regulations.

Rule 6 is repealed by Statutory Rules, 1927, No. 38.

6. The provisions of the Regulations under the *Commonwealth Public Service Act*, 1922-1924, for the time being in force in regard to:—

(*a*) Leave of absence;
(*b*) Travelling allowances;
(*c*) Attendance of officers;
(*d*) Performance of duties; and
(*e*) Overtime payment,

shall apply to officers appointed under the Act, subject to the following modifications:—

(i) In regard to officers of the Council, the powers and functions of the Public Service Board under those Regulations shall be exercised by

the Council, and the powers and functions of the Permanent Head and the Chief Officer shall be exercised by the Secretary of the Council; and

(ii) In cases where the Council considers it desirable in the interests of the Council that leave of absence be accumulated for more than two years, leave of absence may be so accumulated.

Powers of Council in regard to expenditure.

7. The Council shall have power to expend at its sole discretion, from moneys standing to the credit of the Science and Industry Investigation Trust Account, sums not exceeding One hundred pounds in each case, on any matters or subjects of investigation or on apparatus connected with any work of the Council, for which provision has been made in the Estimates of expenditure which have been passed by both Houses of the Parliament.

APPENDIX V.

COMMONWEALTH OF AUSTRALIA.

SCIENCE AND INDUSTRY ENDOWMENT FUND.

NOTES ON THE ADMINISTRATION OF THE FUND ESTABLISHED BY THE SCIENCE AND INDUSTRY ENDOWMENT ACT, 1926.

A.—*General.*

1. By the *Science and Industry Endowment Act*, 1926, a sum of £100,000 was appropriated out of the Consolidated Revenue Fund, and a fund, known as the Science and Industry Endowment Fund, was established. The fund consists of—

(*a*) the amount appropriated and the income derived from the investment of that amount, or any part thereof; and

(*b*) gifts or bequests given or made for the purposes of the fund and the income derived from or proceeds of the realisation of the property so given or devised.

2. The fund is vested in and placed under the control of trustees, who are the members for the time being of the Executive Committee of the Commonwealth Council for Scientific and Industrial Research.

3. The income derived from so much of the fund as represents the amount appropriated by the Act is to be applied *to provide assistance*—

(*a*) to persons engaged in scientific research; and

(*b*) in the training of students in scientific research.

Income from gifts or bequests is to be similarly applied unless it be otherwise provided in the conditions under which such gifts or bequests are made.

4. While the trustees consider it advisable to retain considerable freedom in their administration of this fund, particularly during the first years of its application, and hence do not propose at this stage to frame set regulations, they think it desirable to lay down a few general rules for their own guidance, and for the information of those workers in science who will, it is hoped, take an active interest in making this fund of real value in the development of research work in Australia.

5. The present income from the fund is approximately £5,000 per annum, but it will be some months before sufficient interest has accumulated to enable the trustees to set their plans in full operation.

B.—*The Training of Students in Scientific Research.*

1. The main obstacle in the way of development of the Council's activities is, and will be for some years, the lack of trained scientific workers. The trustees, therefore, are of the opinion that for the present their main object in administering the fund should be the provision of assistance in training Australian students for positions as research officers of the Council. It is anticipated that about four-fifths of the present income of the fund (i.e., about £4,000 per annum) may very properly be applied to this end by the establishment of Research Studentships tenable by distinguished honours graduates of Australian Universities or Technical Colleges who have proved to the satisfaction of their professors or other supervisors that they are capable of taking full advantage of an opportunity for intensive training in

scientific research. As a rule, such studentships will be held abroad, but the trustees do not wish to debar themselves from choosing an Australian University or other institution as a field for training.

2. It is proposed that such studentships shall be tenable for two years and shall carry an allowance of £300 per annum, together with such additional allowances for travelling fares outwards and homewards as may be required. It is estimated that on the average £150 will cover the latter, so that the annual cost of a student will be about £375, or, say, £400, after allowing for any special expenses (fees, travelling, &c.) incurred while abroad, and not rightly chargeable as personal expenses. The expenditure of £4,000 per annum will thus permit the maintenance of ten students abroad. Such students will be expected to give the Council an option upon their services for three years, on their return to the Commonwealth, at salaries specified at the time of appointment. In the appointments already made, the minimum salaries proposed have been £400 for the first year, £450 for the second, and £500 for the third year.

3. The trustees will make appointments to studentships as occasion arises and as men or women of the requisite ability are available. They will be grateful to University professors or other teachers who will bring to their notice students of outstanding capacity, whether or not at the time public announcement has been made of an intention to make appointments.

4. In making appointments the trustees do not desire to receive from candidates formal testimonials from a number of teachers or others. They prefer to rely almost wholly upon the personal report of the professor or other supervisor under whom the candidate has received his higher training and carried out investigations. In effect, this means that leading scientific men of the Commonwealth are asked to assume personal responsibility in advising the trustees as to the selection of suitable men.

C.—*The Assistance of Persons engaged in Scientific Research.*

1. At first the trustees will have about £1,000 per annum available for the assistance of persons engaged in scientific work; but in the course of time the pressing need to send students abroad for training will no doubt abate, thus freeing further money for the other main object of the fund. It is hoped, too, that public and private benefactions will materially add to the sum annually available for this purpose.

2. The trustees retain the right to obtain what in their opinion is the best advice available to assist them in dealing with any applications under this head.

They propose, for the present, to follow somewhat closely the lines which have been proved satisfactory by the British Department of Scientific and Industrial Research, and to invite applications for grants for any of the three following objects:—

(i) To provide personal payments to investigators to enable them to give whole or part time to a research conducted independently or in collaboration with a professor or person interested in the development of such research;

(ii) to provide laboratory, clerical, or other assistance to persons engaged in research;

(iii) to provide grants for special equipment and other special expenses incidental to research.

3. In no case will the trustees entertain applications for assistance when, in their opinion, such assistance should be provided by existing institutions.

Mr G. A. Julius.

Thus, they will not consider applications for personal payments to members of the staffs of Universities or other institutions having research as one of their functions, holding, with the British Advisory Council, that "research, no less than teaching, is a primary function of these institutions, and the salaries attaching to posts on their staffs ought to be sufficient to enable the holders to devote a reasonable proportion of their time to the advancement of knowledge within their respective departments." Nor will they provide technical or clerical assistance of a general kind in a research laboratory, or apparatus which should be part of the normal equipment of a laboratory used for teaching purposes.

4. Applications should be made by the 1st of November in any year so that decisions may be announced well before the commencement of the next academic year; but, subject to funds being available, applications will be received after that date.

5. The results of research may be published as may be deemed best, and a copy of the publication must be sent to the trustees.

6. No commercial use may be made by the investigator of the results obtained unless the consent of the trustees has been obtained.

7. Forms of application may be obtained from the secretary to the trustees.

The following additional rules apply to the three types of grant respectively:—

I.—*Personal Payments to Investigators.*

1. Personal payments will be made only to investigators of proved powers to enable them to devote to some specific research time which would otherwise be given to paid work.

2. Preference will be given to persons whose careers lie in research work. It is not intended, for example, to assist persons who are seeking research degrees as avenues to employment which will not include research.

3. At the end of the period for which payment is made, the investigator will be required to submit to the trustees a report on the progress of the investigation. Interim reports may be called for if the trustees so determine.

II.—*Grants for the Provision of Laboratory or Clerical Assistance.*

1. The trustees will recommend grants under this heading only for the purpose of assisting an investigator in a specific research in which he is personally engaged.

2. The trustees will require a report at the end of each year upon work for which they have provided assistance.

III.—*Grants for Equipment, &c.*

1. All apparatus of a permanent character purchased out of a grant is and remains the property of the trustees, who will determine, in consultation with the investigator, its disposal when the research is completed.

The trustees will be glad at any time to receive suggestions calculated to render more effective their administration of the fund.

G. A. Julius, Chairman
W. J. Newbigin,
A. C. D. Rivett,
} Trustees.

Gerald Lightfoot, Secretary.

314, Albert Street, East Melbourne.
February, 1927.

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Oral Evidence.

57,427. *The Chairman*: Mr. Julius, you are Chairman of the Australian Commonwealth Council for Scientific and Industrial Research?—Yes.

57,428. We have a written note from you. Would you like to make any statement in addition to it at this stage?—I have only stated the position very briefly in that note. I did not quite know how far you wished me to go in the matter.

57,429. Perhaps you will amplify it by answers to questions, and then if you wish to add anything at the end of the examination perhaps you will please do so. Your note on page 634 describes the position as it was before the establishment of the Commonwealth Council for Scientific and Industrial Research. Would it be true to say that there was no centralising of research work following the inauguration of the Federal system until the Commonwealth Council for Scientific and Industrial Research was founded; or had there been some measure of interest, at any rate, shown by the Federal Government?—Yes. The Institute of Science and Industry was formed about ten years ago as a Commonwealth body, and was intended to meet the same requirements as the present Council. That was carried on uninterruptedly until its complete reorganisation in the formation of the present Council.

57,430. Was the Institute of Science and Industry founded on an Act of Parliament?—Yes, the Science and Industry Act, of which our present Act is an amendment. There were certain fundamental difficulties with the old Institute which prevented it from functioning as it was intended to function. It did not receive the support that was essential from the Commonwealth Government. Its vote was steadily reduced from year to year. It started with an expenditure of the order of £40,000 a year, and in the last year of its life its vote was under £10,000. It chiefly failed because it did not secure and hold the support and sympathy of the State peoples and Governments, which is vital in Australia under our rather peculiar conditions.

57,431. In the Federal Constitution, and in the Act constituting the Federation, it is, I think, the functions of the Federal Government which are laid down. Everything else not so laid down falls to be dealt with by the States?—That is so.

57,432. It is precisely the opposite arrangement in comparison with Canada?—That is so.

57,433. Had the Institute of Science and Industry, directly or indirectly, any authority over provincial research Institutions?—None whatever; nor have the present Council.

57,434. There was no tinge of executive authority to account for the unpopularity of the first body?—No, none whatever, but there was immediate anxiety on the part of the States as to whether the Commonwealth was going to usurp some of the States' functions. Victoria and New South Wales have very strong organisations at work, and very many admirable men in their employ on research, and I think they were suspicious that the Commonwealth were going to step in and usurp the functions, and reduce the standing of those State organisations. Unfortunately, instead of disarming that feeling by pulling in these State officers and State departments and making them a part of the controlling body of the new Council, that was not done. In fact they did appoint what they called State Committees, but they never called them together to discuss matters with them. The State Committees were in being during the last five years of the old life of the Institute, but were never once called together. In that way they completely lost the whole of the support and sympathy of the States. This fact was reflected in Parliament by a failure to give them any money, and their funds were steadily reduced.

57,435. As the result of the years intervening between 1900 and the formation of the Institute of Science and Industry, it became evident, I see, that there were certain fundamental types of work which no State was able to deal with?—Yes. That has become increasingly evident as the years have gone by.

57,436. Since the Institute of Science and Industry was founded?—Yes. I would not like it to be thought that the Institute of Industry and Science did not do good work. They did. In many directions they did very fine work, but they were hampered all through by this lack of support and funds.

57,437. Can you cite one or two instances of work of that nature, necessary fundamental work, which was not in fact undertaken by the States?—A typical instance is that of animal nutrition. That is recognised as being work of enormous importance to Australia, to determine fundamentally the factors which govern the growth and development of the frame, the wool and so on. That was work which was naturally very long-dated. The States are very loth to take on research which is long-dated. They are not able to offer their politicians sufficient "plums" to secure an adequate vote. They have also a difficulty in acquiring men of the calibre required for long-dated fundamental research. Again, by the very nature of the States organisations, the time of these men in the State bodies is very largely taken up by routine work, by inspection work, by propaganda and by educational work, whereas fundamental work requires the undivided and continual attention of the most eminent scientists you can possibly get. It is recognised that the Commonwealth can do that work very much better than any State. It is further recognised that it is not a particular obligation on one State to do that work for the rest of Australia, but that it is essentially a national problem. That is one of the works we have already put in hand. We are already committed to quite heavy expenditure. We have got one of the five men in the world available on that particularly difficult work. We are working in co-operation with the authorities at this end, the Rowett Institute at Aberdeen, for instance, and the States are whole-heartedly behind this particular work That is one instance.

57,438. May we pursue that a little further before you go to other instances? At what institution is this work being carried on? Is it being carried on at an institution owned by the Central Government or by a State Government?—State mostly. It is rather a peculiar position. The instructions given to me by our Prime Minister, Mr. Bruce, in organising this new Council, were that in order to regain the confidence and help of the States and to assist them in every way, I was to utilise existing State organisations, State universities and agricultural departments wherever practicable, and to stimulate the work in those departments as far as possible. Only when I ascertained they had neither the men nor the material, nor the buildings, suitable for any particular piece of work, were we to step in. It was to be done only after exhausting all the possibilities of doing it in existing organisations in the States. With regard to the particular piece of work to which I have referred, namely, animal nutrition, we have decided to carry that out in the City of Adelaide, South Australia, for the following reasons. The man we have put in charge was, at the time, Professor at the Adelaide University. He has now severed his connection with that University, and has come wholly under our control, retaining for the present the rank of Professor in the University. We have the permission of the University Council for us to erect the necessary buildings in the University grounds, our men, of course, being subject to their discipline, and their leader getting all the ordinary facilities which a University Professor gets from other university departments, in tests and so on. This has strengthened and increased the standing of the University of Adelaide, so

far as research is concerned. Although we, in that particular case, are putting up our buildings on the grounds of the University, as soon as they cease to be of use to us they become their property, under the terms of our "Gentleman's" agreement with them; we also cannot change the kind of work we are doing there without their consent. In addition to that, some few years ago a squatter in South Australia made a great endowment to the University of Adelaide. He handed over to them all his property just outside Adelaide, and this has now become the Waite Agricultural Institute controlled by the University Council, it being the only one in Australia of that nature. It is under the direction of two extremely capable men, one a general agriculturist and one a soil expert, with a fairly strong staff. It is a most valuable adjunct to the fundamental work which is being carried out for us by Professor Robertson at the University, to have this Agricultural Institute right alongside of him, and for him to be able to carry out practically development and experimental work with men there who are thoroughly conversant with practical conditions and in touch with agriculturists and pastoralists. The combination is very strong. Again, we have given money to the Waite Institute, we are erecting buildings on the ground of the Institute, taking the risk of those buildings falling into other hands than those of the Commonwealth Government. There is no legal agreement between us, and we are carrying out our research on the grounds of the Waite Institute in buildings put up by us, but which will ultimately be owned by them. That, I think, is going to work admirably. We are doing the same in a minor way in New South Wales, at Glenfield, for the State Agricultural Department.

57,439. Will your animal nutrition experts at Adelaide University be allowed to do any teaching?—We have in that particular case agreed that the Professor shall be allowed to give ten lectures of one hour each during the year—for two reasons, one because we recognise the serious loss to the Adelaide University of Professor Robertson, and, secondly, because we believe that there is a certain amount of value in keeping a man in contact with the educational side.

57,440. Do you find that the Constitution of the Commonwealth Council for Scientific and Industrial Research is satisfactory, and that it satisfies the constituent States of the Federation?—Yes. We have found it admirable. It has, we believe, within the twelve months of its operations, regained the support and sympathy of public and scientific bodies in the States of the Commonwealth. They are now working with us most wholeheartedly.

57,441. The distances in Australia are considerable. How often does the body meet?—The body consists of an Executive of three, of which I am Chairman. Although I live in Sydney, I have attended some fifty meetings in Melbourne in twelve months. The Council met in its first year three times, but normally we expect the Council to meet twice a year. My chief Executive Officer, Dr. Rivett, is one of the three members of the Executive, and he makes it his business to travel round Australia in order to keep in intimate contact with the members of the Council and with the government, industrial, and scientific, organisations in each centre.

57,442. Do you regard it as essential that the Federal Government, or its representatives at the centre, should have at its disposal a whole-time officer touring round Australia in order to keep you in touch with details?—No, not altogether. Originally, under Sir Frank Heath's scheme, there was to be an Executive of three, and a Chief Executive Officer who was to be a man of lesser standing than we have got now. We altered that scheme with the permission of the Prime Minister, suggesting that, just as in the case of an industrial organisation, we should make one of the three members of the Executive a sort of managing Director, make him Chief Executive Officer, influenced, of course, very largely by the character and personality of the

man we had available on the Executive, Dr. Rivett. In the first year it has been necessary for Dr. Rivett and myself to travel round a very great deal, but part of our organisation, whole-heartedly endorsed by the States, is to get round us a body of six or seven of the very best men that we can obtain in the various branches of science and to utilise these men in two ways, *one* to do research work themselves, fundamental work, where it is not being undertaken by State departments, but secondly and for the present more particularly to travel round, and to keep in intimate touch with the research men in the various States. At present there is a certain amount of unavoidable dissipation of effort and of overlapping, and we hope to be able to get the whole of the research work throughout all the departments in Australia carried forward in a well-considered and more nationally efficient way. We are influenced in this by the fact that the supply of trained men is extraordinarily inadequate. We have only got two of our six or seven men so far, but as soon as those six or seven men get to work Dr. Rivett then would undoubtedly not have to travel round as much as he does at present.

57,443. Do you aim at getting one or two of these six or seven men in each State?—No. These six or seven men will nominally be at the headquarters of the Council, which for the time being is in Melbourne, but which undoubtedly, in perhaps five or six years, will be moved to Canberra.

57,444. They will be whole-time officers?—Yes, and there is an abundance of work waiting for them.

57,445. They will be in the position of officers travelling about in order to survey the situation in the States, and to keep the centre in close touch with everything that is going on?—And generally to advise and help these men working in various parts of the country, and to correlate the work generally throughout the whole Continent.

57,446. *Mr. Noyce*: Will they do any research work themselves?—Yes.

57,447. *The Chairman*: It is perhaps worth mentioning that you have very varied conditions of climate and agriculture in Australia?—We have.

57,448. What funds are at the disposal of the Scientific and Industrial Research Council to-day?—In the first year, last year, Parliament voted us £250,000 to spend as we found necessary, the only condition being that we should submit estimates, not in detail, through our Minister. Those estimates have to be approved. None of the money unspent reverts to the Treasury.

57,449. It is a non-lapsing fund?—The money never leaves the fund. In addition to that, they gave us a trust fund, vested in the name of the three members of the Executive, of £100,000, the interest of which is to be devoted entirely to the training of research workers and to making "grants-in-aid." Since that date, about three months ago, owing to the experience we had gained, we made strong representations to Mr. Bruce that we ought to have a larger sum available, the reason being that we were faced with great difficulty in obtaining men, and in trying to attract them from permanent positions in Universities—men who had a life appointment there, with perhaps retirement at the age of sixty or seventy with pension rights. We were trying to attract them to a new Government department, dependent to a certain extent upon political vicissitudes. Therefore it is extremely difficult for us honestly to take a man away from a life job and to put him into something which we feel might not endure sufficiently long to give him time to prove himself. We therefore urged that Parliament should make a sufficient sum available to us so that we might have sufficient to prove ourselves. We all feel that we can make such a showing after five years that neither the Government nor the people will want to make any alteration. We asked Mr. Bruce for a further £500,000, and we understand that it was discussed by the

Cabinet and agreed to. Mr. Bruce made a public announcement that at the first meeting of Parliament he was going to secure Parliamentary consent to make a further substantial grant to our funds. If we get what we asked for, it will bring our funds up to £750,000 to be spent directly, together with the trust fund of £100,000, for the training of research workers. As an off-set to that, last year, the first year of our existence, our estimate was £50,000 and we spent £40,000. This year our estimates will run up to something like £110,000. We understand definitely that a substantial grant is to be made.

57,450. Reconsidering the position later on?—Yes. All we are anxious to see at the moment is that there are enough funds available to prove the organisation.

57,451. In terms of annual income what do you expect to spend?—Probably, after we have got going, we shall be spending not less than £150,000 a year.

57,452. Will you give the Commission some idea as to how that will be spent? How much will go on salaries of officers?—Our overhead central organisation vote is of the order of about £18,000.

57,453. Then you have this grant-in-aid of work being carried on in Universities or research institutions under State control?—Yes. I am sorry I have not a copy of our estimates with me.

57,454. It will be very interesting to us if you will send us a copy?—I will. It is extremely difficult, in an organisation such as this, to separate what are salaries in the way of overheads, from actual research expenditure, because, after all, all these leading men are research men. They are doing part of the work for which we are constituted. Our clerical organisation is small.

57,455. How far do you think your authority and advice in the States is rendered palatable by the fact that you have certain funds at your disposal?—I do not think it has very much bearing. There is a very real feeling in the Commonwealth that the only thing which can save agricultural work in Australia is scientific research, and I think almost all the people interested have a very clear recognition of the fact that the work must be done. As an instance, let me mention three things. Within the last four months we have been offered by one of the State Governments, free of all taxation charges and on a 99 years' lease, 30,000 acres of the best sheep country in that State, to do what we like with as an endowment for our work there, provided that we continue research work in connection with wool. It is right to say that that has not yet been accepted, because there are certain fundamental difficulties in the way, but it is an evidence of the real interest which is being taken in the work. Secondly, we have just completed arrangements under which the British Australian Tobacco Company furnish a sum of £20,000 contingent upon the Governments finding £10,000, making a total of £30,000, for investigation into the possibilities of growing satisfactory tobacco leaf in Australia, without condition, the whole organisation to be controlled by the Development and Migration Commission, by my Council, and by a third man, a nominee of the two bodies. If, at the end of that time, the work appears to be developing satisfactorily, the Tobacco Company will make available a further £30,000 contingent upon the Governments of Australia contributing another £30,000, bringing the total research fund on tobacco culture up to £90,000, without any condition whatsoever on the part of the Tobacco Company as to how we are to do our work. They leave it absolutely to us to carry out that work. Again, the pastoralists of Australia have decided to try to raise a fund of a quarter of a million to be devoted to research in connection with the wool industry in collaboration with us.

Those three cases clearly indicate, I think, the steadily growing conviction that research work must be done, and that it has got to be done, nationally rather than by Independent States wherever practicable.

57,456. This recognition of the need for research on a national basis surprises me a little. After all, these States are extremely conscious of their autonomous position and jealous of their rights. They have vast territories. Do they never claim that central research should be central in the States sense rather than central in the national sense?—No, because I think each of them realise that finance is an ever-present difficulty, and that each State feels "Well, is it not just as much the other State's duty to do this particular bit of work?" That is always standing in the light. For instance, the problems in Western Australia, so far as sheep are concerned, are precisely the same as they are in New South Wales and Victoria and Queensland; and Western Australia says "Why should we saddle ourselves with this expenditure."

57,457. It is never suggested that if the Federal Government reduced Federal taxation by the amount they are spending on research, the States could recoup themselves by increasing their's?—It has, so far as I know, not been suggested, and I do not think, in the very nature of things, it would be likely to be suggested. We think we are now on excellent terms with the States and that they realise that we can get, nationally, a better organisation and a better team together than any individual State can ever justify. That lies at the root of the whole thing.

57,458. How long have you known Australia?—I left London for Australia 44 years ago, and I have been there ever since.

57,459. Will you tell the Commission whether you think that, at an earlier stage of the life of the Commonwealth, a proposal of this sort would have been well received by the States? For instance, let us say in 1910, ten years after the Commonwealth was founded, do you think the States would have been willing to take this sort of view?—No, I do not think they would.

57,460. It is a question of time and experience?—Yes.

57,461. And of a growing breadth of view?—Yes, and growing pressure from the public themselves.

57,462. A reflection of the economic pressure?—Quite. I do not think it would have been welcomed in 1910.

57,463. Would you like to see your funds expanded to a point which would make it possible for you, as a central organisation, to give grants, let us say, on a £ for £ basis for particular work to be carried out by the States and by their own institutions?—We are not doing it on any definite £ for £ basis, but we are now making grants to them. We make grants, for instance, to the Agricultural Department of New South Wales. We are paying for, and supplying them with, two of our men who are helping them out on the blow-fly problem. These men are under their discipline entirely. We hand them over to them. If they like to dismiss them they can. We have simply said to the Agricultural Department of New South Wales: "We think better work can be done in connection with blow-fly. Can you stimulate that work? What is wanted?" They say: "We want more men." We say: "All right, we will give you the men." We have given three men to the Glenfield Research Station in New South Wales for further work in connection with certain diseases of stock, notably one which is giving very great concern to Australia at the present time. We are subsidising work at the Melbourne University, at the Sydney University, at the Brisbane University, and at the Perth University. We have made arrangements with the Government of Western Australia to put up £ for £ with them in connection with certain work on tanning, Western Australia having given much more promise in that regard than any other State. But in general, the principle of £ for

£ grants has not been considered. We have discussed the matter frankly with them, found where the need exists, and if we have been able to help we have handed over money; always with some definite understanding that in some way we must be linked with the work. We have refused absolutely to be put in the position of having to go to our Ministry and say: "We have granted £5,000 to the Agricultural Department of New South Wales, but have not any knowledge of what they are doing with it." Take the blow-fly investigation as an example. That is a trouble which, in a bad year, has cost New South Wales over £4,000,000 per annum. They have, in the New South Wales Agricultural Department, what they call a "Blow-fly Committee," which directs the investigations which are in hand to tackle that trouble. On our suggestion to the Minister of Agriculture of that State, they at once agreed to add to that Committee one of our representatives, so that he may at all times be conversant with what is being done, and keep us in the closest touch with it. As soon as we get our Entomologist, we have promised to put him also at their disposal, to discuss the work they are doing with the Government Entomologist in New South Wales, and so on.

57,464. You are able to achieve all this within an annual expenditure of £150,000. Is that so?—Our present estimate is £120,000. I would not like to forecast too closely how far that may grow, because the problems in front of us are tremendous.

57,465. What is the constitutional position of this Fund which you administer? Is it made over to you in the shape of a lump sum?—Yes.

57,466. Over a certain number of years, or capital put down?—Capital put down for us to spend.

57,467. Do you spend it by the authority of any particular Minister?—Yes. Both the Development and Migration Commission and my own Council were transferred to the Prime Minister's department under Senator Pearce, who is Vice-President of the Executive. Mr. Pearce is acting for the Prime Minister, as the Prime Minister is unable to give his own time to the details.

57,468. He is responsible to Parliament for the expenditure which is made?—Yes. He gets our estimates approved year by year. Our estimates are put forward in as elastic a form as possible because it is almost impossible to tie down research work.

57,469. Have you found Parliament jealous of these arrangements?—No. The Act was passed unanimously by both Houses of Parliament; the only comment from the Opposition was that the vote instead of being £250,000 should have been a million pounds. That was from the Labour side.

57,470. You do not anticipate any friction in Parliament in the matter of the administration of the Fund?—Not at present; I will not say any more than that, at present, there is no evidence of it whatever, and I honestly think that Parliament has made up its mind, firstly, that the work is badly wanted, and secondly, to give us a fair trial.

57,471. You have no security in the future. Parliament can either continue or withhold the necessary funds when the time comes when you have disposed of the present sum?—Yes. That is why we have asked for another £500,000. We believe by the time we have spent £750,000, no Government in Australia will be able to shut down such essential work.

57,472. After how many years from the year you started do you think further funds will be required? How long will it take you to spend your present money?—At the present rate as far as we can forecast now, I think the £750,000 ought to see us through five or six years.

57,473. You have five or six years security?—Yes.

57,474. The Treasury cannot raid this fund?—It is a definite appropriation of Parliament for this specific purpose under the Act, and we are able to make our estimates fairly high because anything unspent goes back into our Fund.

57,475. Is there anything like unanimity of opinion amongst research workers in Australia as to the need for centrally conducted research, or is there a strong party which takes the other view?—I do not think there are more than a few individuals who take the other view. I think that is evidenced best by the resolutions which were carried at the Conference which was called last March with the consent of the Prime Minister and of the Premiers of the States. At that Conference, the three members of the Executive represented the Commonwealth. The permanent head of each of the State agricultural departments, its Chief Research Officer and the Professor of Agriculture at each University, or the corresponding position were present, and after three days' deliberations we came unanimously to certain conclusions, which, I think, very clearly set out the extraordinary unanimity of opinion amongst the three groups, the Commonwealth as represented by us, the State Departments as represented by the permanent heads of those Departments plus their scientific officers, and the Universities as represented by their Professors. We agreed definitely upon the functions of the Commonwealth and of the States throughout the whole programme of agricultural research.

57,476. Is much research work being carried out by institutions not under Government control in Australia?—Not a great deal, in fact relatively little.

57,477. Do you include the Universities in the category of institutions not under Government control?—No.

57,478. Between the Universities and other Government institutions?—There is quite a lot between Universities and other Government institutions. There is not very much outside those two kinds of organisations.

57,479. The Universities are doing a great deal, are they?—Some of them. The great disability in the Australian Universities is their shortness of staff and their shortness of funds. No Professor, practically without exception, has sufficient time to devote to real research work. There are, on the other hand, younger men under them in certain cases who are doing quite remarkable work.

57,480. Are you dependent, in the main, upon research officers trained in Australia for your recruitment, or are you drawing from the whole world, Great Britain in particular?—We approached the Chancellors of the Universities before our Act was passed, telling them that we wanted to send ten men away that year for certain specific work, and asking whether they could give us the names of selected graduates who had done at least a year of research, preferably Honours men, the applications to be accompanied by personal letters of recommendation from their Professors to the effect that they were exceptional men. We were able to secure eight quite capable men out of the ten we wanted. Five of those are in Great Britain; and four are in America. We propose to send away, if we can get the men, eight this year. It is already clear, however, that we are not going to get them.

57,481. In Australia?—No.

57,482. Why not?—Because the men who are wanted are those who have received biological training in botany, entomology and veterinary science, and not so much those trained in physics and chemistry. The whole tendency of the educational system both here and in Australia seems to be by the teaching of physics and chemistry at the schools, to divert the best men into those sciences, so that they have easy subjects when the go to the University. Another reason which has operated has been that in

the past it has been almost impossible for Entomologists and Mycologists to earn a decent living. They were paid a year ago in Australia less than we pay our mechanics. We took a first-rate Entomologist who was in the Museum of Victoria, a man of 45, and an extraordinarily capable person, and his salary at that job was about £400 a year. We are paying many fitters £8 a week. That is one reason.

57,483. Will you be able to get your men elsewhere?—The Royal Commission will be as aware as I am of the acute difficulty of getting first-class scientific workers, especially on biological subjects. So far, we have experienced great difficulty, but we expect to succeed. There is one thing which perhaps I have not made clear. We urged, when we took up this work, that we were not to be under the Public Works Act or the Public Service Commissioners. We pointed out that in dealing with scientific research one must be able to get the very best men one could and to pay what was necessary in order to get them, and that anything short of that was of no use to us. Under our Act it is specifically and definitely provided that we are not in any way governed by the conditions of the Public Service Act.

57,484. Is there any feeling amongst the public in Australia against bringing in men from overseas?—No, if you honestly advertise the positions in Australia and show a real desire to give an Australian a chance. Up to the present eighty per cent. of our appointments have been Australian.

57,485. *Professor Gangulee*: They are trained in Australia, are they?—Most of them were originally trained in Australia. Some of them have been imported into Australia many years ago.

57,486. *The Chairman*: What precisely are the restrictions in service coming within the Service Commission, from which you desire to escape?—The whole matter of appointments is graded.

57,487. It is a question of control of salaries, is it?—Yes, and conditions, and a host of other things, such as seniority. It all makes it almost impossible to get a man from outside.

57,488. Is there any stipulation that you must recruit men born in Australia?—No; it is not provided that they must be born in Australia, but preference is always given to Australia born men, if they are available.

57,489. *Sir Thomas Middleton*: When you approached the University of Adelaide with the object of setting up a Nutrition Institute, I understand that you took from them their Professor and established him in the precincts of the University as your man?—Yes.

57,490. Was there any discussion as to the other policy of attempting to get the University of Adelaide to take up the work as a University, and to keep their Professor, and to develop the research as part of their normal functions?—Yes, that was very carefully considered.

57,491. What induced you to take the course you did?—It arose in rather a curious way. An offer was made to the University Council of Adelaide that money would be made available to them on a £ for £ basis if they would take up certain work, but the University of Adelaide found themselves unable to take it on or to accept the offer. It was agreed also that nationally it was better that all such grants should be handled by a national body, as such a body would be in a better position to avoid overlapping, and to determine just where the right men were located, and just what organisation had the right equipment. That has now been generally accepted. It was thus agreed that the offer in question should be transferred to us. We took it up, and we developed from that, with the complete co-operation of the University Council of Adelaide.

57,492. The primary reason in the mind of the University authorities was a financial one, was it?—Yes, at that stage; but there were other

reasons. For instance, in the University of Adelaide, just as in other Universities, there are certain provisions regarding the uniform payment of Professors. It simplifies the operations very materially. In our case we are bringing in men who, first of all, have to work twelve months against nine months. The whole position is thus altered, and they, the University, would, I think, prefer that they were our employees rather than the University's employees. Further, also, it was recognised that ultimately much larger sums would be involved, and this was easier for us to face.

57,493. That same position has arisen here, but our Professors recognise that if a research man works twelve months instead of nine months there may be some ground for differentiation in salary?—We have had some trouble with the Universities in that regard. We recommended the Commonwealth Government to offer a seat on the Executive of the Council for Science and Industry to a Professor attached to one of the Universities. The University Council finally agreed to the suggestion, but the main stumbling block was that we insisted that the Professor should receive a fee for his services on the Executive. This was objected to at first on the ground that it disturbed University practices, but it has since been agreed to.

57,494. Your present pool of research men who are free to go out to different States consists of about five or six members, does it?—We have not got them all yet. We have Professor Robertson, and we have an arrangement with the University Council of Melbourne University to allow their Professor of Veterinary Science to be our adviser *pro tem*, they freeing him as we require him. We have also the same arrangement with the Senate of Sydney University in regard to the Professor of Agriculture, and we are carrying on under those circumstances until we can gradually fill up our team.

57,495. You do not think of continuing that plan of borrowing from the Universities the most suitable men for your particular work for a temporary period?—No. It does not suit the Universities and it does not suit us. It does not suit the Universities because it interferes with their teaching work, and it does not suit us because vital problems requiring immediate attention arise, and we cannot get the man because he has urgent University duties. We have up to the present been borrowing wholesale.

57,496. You mentioned the case of New South Wales and the blow fly pest. How did that arrangement arise? Did they approach you, or did you approach them on that subject?—It was neither, quite. We borrowed the Professor of Veterinary Science for Melbourne University, and asked him to obtain the considered opinion of the leading veterinary men in the Commonwealth as to what should be tackled, and how we could help. Professor Woodruff was commissioned by us, with the consent of his University, to form a Committee representative of the State Agricultural Departments and of the State Universities. That Committee met several times and finally submitted to us a programme of work which they thought could be tackled at once; how it should be done, and what we should do by way of financial help and in getting men. With some modifications, that report was adopted as a first step. Amongst the items in that report was the development of the work on "blow fly" research, by the provision by us of two extra men for the State Agricultural Department of New South Wales.

57,497. How did that application reach you? Did it come direct from the University or did it come up by the Minister of Agriculture for New South Wales?—No, it came through this Committee.

57,498. Direct?—Yes, but we then interviewed the Under Secretary for Agriculture in New South Wales. We formulated a programme, which after discussion with his Ministers, was adopted. In certain cases, State

Governments have made definite application to us, through the Federal Prime Minister, for assistance in certain researches.

57,499. Have you formulated some sort of definite policy as to the amount of assistance that would be given in approved schemes? Do you adhere closely to the £ for £ basis, or may you vary it anything from twenty five per cent. up to seventy-five per cent. just as you wish?—We are entirely free. In some cases we give a hundred per cent. In others it represents only a small percentage. We are entirely free to use our own judgment and have no limitation whatever except the approval of our Minister.

57,500. Are there any cases in which you have given a hundred per cent.?—We are giving it in the case of animal nutrition. We have just started a large research at the Waite Institute on virus diseases of plants. We have put up greenhouses costing £2,000, and are supplying the money for the investigators. The Waite Institute is giving us the service of its Director in the control and organisation of the work.

57,501. Can you remember a case where you have given fifteen or twenty per cent. as opposed to the whole hundred per cent., to a scheme which is essentially a State scheme? Have any such come before you?—With certain problems in Queensland we have done that, certain banana disease problems which are peculiar to Queensland and Northern New South Wales. There we have given varying amounts, depending upon the agreement which has been come to between the three Governments. We are giving about twenty-five per cent. in two cases there.

57,502. To go back to this group of scientific men, the five or six men whom you are attempting to secure at the present time. It is clear, I think, that if your work extends in the directions which you indicate, those five or six men will not go very far over the Continent of Australia. Have you contemplated enlarging their number considerably?—The five or six in every case involves the supply of the necessary assistants in each of the branches. One of these five or six would be our Entomologist. He may have six or seven entomologists under him, depending upon the needs of the work. If we get a "Chief" for the entomological work, we already have two junior men available on the spot, and two more in America undergoing special training there.

57,503. On your Central staff?—Yes.

57,504. *Dr. Hyder*: With regard to the question of the division of powers between the Federal Government and the States Governments, what powers are made over to the Federal Government and what are made over to the States?—I do not remember it in detail, but under our constitution certain definite powers are given to the States. This cannot be varied except by a referendum of the people. Such matters as customs, postal arrangements, telegraphs, weights and measures and others, are Commonwealth functions.

57,505. They are definitely mentioned in the Act, are they?—Yes. The States almost exclusively deal with education, land, mining, transport, and a great many other things.

57,506. *Mr. Noyce*: Is agriculture specifically mentioned in the Act?—I cannot remember. The Federal Government have never had any Department of Agriculture, nor of Mines, nor Education. There is a feeling throughout Australia that a Federal Geological Survey should be made, but there is no Federal Geological Department in existence to undertake it. There is also no Federal Education Department. These are all State functions.

The Chairman: We will get the Acts.

57,507. *Dr. Hyder*: What is the point of giving the same salaries to all the Professors in the Universities?—It eliminates a lot of argument. I should like to make it clear that the same salaries are not given to the same Professors in all the Universities collectively; it only applies to the Universities singly, but every Professor, in one University at least, receives the same salary.

57,508. What are those agricultural training colleges for? For what do they train men? Do they train men to be officers in the State department? —Very largely.

57,509. Or do they train them to become Professors at these different Faculties?—No. They train men chiefly to take inspectorships, and to undertake research in the State agricultural departments, and also for the positions in the veterinary services.

57,510. What is the relationship of these agricultural colleges to the universities in any particular State?—In most cases there is no direct association between the agricultural college and the university.

57,511. These agricultural colleges are State Government departments, are they?—Yes, under the Agricultural Department.

57,512. And are the universities also State Government departments? - They are State universities.

57,513. But there is no connection?—No. In three States there is a definite Faculty of Agriculture at the University in New South Wales, Victoria and Western Australia.

I was wondering whether you have interested yourself in the affairs of India, so that I might put to you one or two questions, if you are willing to answer them?—I am afraid I do not know sufficient of Indian conditions to make my replies of any value, except on the general need for agricultural research work.

57,514. How do you find out when a problem is not a national one, but is confined to a certain tract? How do you determine when a problem is a national one and when it is not a national one?—We decided at the Agricultural Conference that the permanent heads of the State Agricultural departments and Professors of Agriculture should be an Advisory Committee to our Council for the consideration of such problems as that, so that when matters came up, we might refer them to the Committee for advise as to whether they thought it was something which could better be done by an individual State, or by a group of States, or by us. It is an Advisory Board to our Council.

57,515. *Professor Gangulee*: In each State?—No. I am speaking of an Advisory Board which includes the permanent heads of the agricultural departments of the six States. It is fairly clearly set out in the agreement which has been come to between the Council and the heads of the agricultural departments and the University Professors. It is all clearly defined in this document which I have before me, but which I am afraid is too long to read. I think, however, it might be of interest.

57,516. *The Chairman*: Will you put that in for our information?—I will send you a copy.

57,517. *Mr. Noyce*: Are the members of your Executive Committee of three whole-time officers?—No. I am not a whole-time man. Professor Richardson is not a whole-time man. It was not intended that any of them should be, but recently Professor Rivett has been made Chief Executive Officer, and is also a Member of the Executive, so that he now is the only whole-time man of the three.

57,518. What are your other duties, if I may ask that question?—I am a Consulting Engineer in Sydney. I hold certain other positions, but that is my profession.

57,519. *The Chairman*: You are not a Government servant?—No, only partly.

57,520. *Sir James MacKenna*: Can you define the scope and the object of the Commonwealth Council a little more fully?—It is defined in the Act very briefly, of which I sent a number of copies here.

57,521. Will you just develop it a little for us?—Sub-Clause 2 of Clause 11 of our Act defines the powers and functions of the Council and, its provisions are very wide. (*The Witness here read the Section in question.* See pages

640 and 644.) Our Council has now definitely been entrusted with nearly all Commonwealth research work outside Public Health, and the work of the Defence and Customs Departments.

57,522. *The Chairman*: Then it would not be open to you to make a grant for education, outside agricultural education, or anything of that sort, would it?—I do not think that was contemplated. We have, however, a definite duty to assist in the training of men, and that can be stretched to cover a certain amount of education.

57,523. *Sir James MacKenna*: Do you think the unanimity which exists between the Commonwealth Council and the State's workers is due to the fact that you can employ a superior type of research worker, or is it due to the fact that you can take up subjects like mycology, entomology, biology, chemistry, and the more abstruse subjects on which the individual States are not in a position to employ experts?—In all those three sciences they have officers in the agricultural departments of New South Wales and Victoria, but it is very difficult in the State departments, which are governed by Public Service Commissioners, to offer salaries sufficient to attract front-rank men, particularly now when there is such a wide demand for such men.

57,524. So the unanimity which has taken place is largely due to the superior staff of officers which you are in a position to get?—Our Act enables us to get the best men, and generally gives us a freer hand, whereas the States are not so free.

57,525. Supposing you had well-developed departments in the States with fairly senior officers, do you think this Central Commonwealth Council idea would have worked with so much harmony? Supposing you had had State departments which had been running for twenty years, and which were staffed with men who had attained high standing in their subjects, do you think then that you would have obtained the unanimity to which you have referred?—Yes, I think so, because there is a growing recognition of the fact that so many of these problems are essentially national, and that each State, after all, is only a part of Australia.

57,526. *Professor Gangulee*: Was there a serious waste of effort resulting from the overlapping of research before the Council was set up?—There has sometimes, I think, been a waste of effort. There are men in four or five centres tackling the same problem.

57,527. And now, under your system, you have evolved this judicial distribution of research problems?—We are trying to assist in the utilisation of the men available to the best advantage, but I would like to make one point quite clear. Each research organisation, or each department, remains in fact an absolutely free agent to undertake any research which it cares to undertake. The agreements we have come to with them are simply to the effect that we propose and hope to work with them. We have no power to say to the Agricultural Department of New South Wales, for instance, that they should not undertake research in any direction they like; nor can they say the same to us.

57,528. But the Council undertakes to distribute the research problems, does it?—We have agreed that that is what we are going to try to do, and that is what we are doing.

57,529. You say: "*This* is national, and *that* is State"?—Yes, but we do that in consultation, and not of our own initiative.

57,530. What specific organisation has the Council set up for the correlation of work carried on by the States?—We have, in each State, the State Committees of the Council, consisting of three representatives of the scientific departments of the State Governments, three from the University of that State and three or more from the industries of that State. That covers State interests, and the Chairman of each State Committee is a

member of our Council, so that it pulls each State right into the organisation.

57,531. You referred, in the course of your evidence, to the Conference which was held in March, 1927. I see that there you proposed to develop something in the direction of a clearing house for information and research. Could you deal with that a little more fully?—That was at the definite request of the heads of the agriculutral departments, who said that much good research work was being done by their officers, but there was the greatest difficulty in getting this effectively published and distributed amongst scientific workers in the Commonwealth. They thought the work could be very much better handled by a national body, and they asked us to undertake it, which we agreed to do.

57,532. Further on you say: "The Council should adopt a scheme which will enable the Universities to attract students to the Faculties of Agriculture and of Veterinary Science by notifying that appointments will be available for suitably trained men." What is the scheme which you have in mind?—There are two ways. In the past, most men have been attracted to physics or chemistry. At the present moment the Universities of Australia and the Governments, are extraordinarily generous in regard to the free Scholarships and Exhibitions which they give, but it has become the custom almost in every University for the best men to go to physics or to chemistry, and frequently only those that are left go to veterinary science and to agriculture. We hope that by making available good appointments, and by paying adequate sums, we may attract good men who may perhaps have already graduated in physics or chemistry, and by giving them a special two years course in some biological science, to fit them for our work at our expense.

57,533. Do you guarantee them posts?—We guarantee and pay for the training only.

57,534. But you do not guarantee that after they have got the training you will appoint them somewhere?—We never guarantee that. None of our research workers are guaranteed a post. We have an option on their services at certain minimum rates of salary.

57,535. I understand you also propose a form of tropical agricultural research institute. Has that idea been developed?—That is a proposal which has emanated from Great Britain. Enquiry has been made whether we are willing, on a £ for £ basis, to establish, in Northern Queensland, a Research Institute as part of a chain of tropical agricultural research stations, the other two being Trinidad and Kenya. They wish the third, dealing particularly with animal husbandry (which is a matter of very great interest to us) to be located in Northern Queensland. That matter is now under consideration, but the details have not yet been finally settled.

57,536. On the question of livestock research in Australia is this problem tackled nationally or by the States?—It is tackled by both. Such livestock research covers fundamental research in many directions, and all questions of animal diseases, and so on. The States are doing a great deal of extremely valuable work. We are also doing work.

57,537. The Central Government undertakes fundamental research on livestock, does it?—Yes, and we are also subsidising a considerable amount of research into particular diseases in various State organisations.

57,538. *Mr. Noyce*: When you refer to livestock research, are you not referring only to research on diseases?—No, animal genetics, and animal husbandry generally.

57,539. *Professor Gangulee*: Is the control of contagious cattle diseases entirely under Federal authority?—Yes, I believe so.

57,540. How do you enforce the Act: through your own agencies?—That I do not know.

57,541. *Mr. Calvert*: Would you tell us exactly what the difference is between the old Institute and the new Council that has brought about the popularity of the Council?—I think it is largely due to the fact that in some way they did not appear to consult State opinions, or State men, upon what should be done. They called committees into being but in recent years discussed nothing with them, and submitted nothing to them.

57,542. It was in the Constitution?—It was in the Constitution that there might be State committees, and they did, in fact, appoint State committees, but for several years past they were never asked to meet, which possibly was worse than if they had never been appointed. Many excellent men were associated with them on those committees.

57,543. The cause of the unpopularity was more in the method of work than in the Constitution of the Institute?—No, not altogether, because fundamentally, under the old Act there was almost an autocracy. There was to be a Director, in fact the old Act really prescribed nothing but the Director. The whole of the power lay in his hands. Now the States play a very definite part in the control of the organisation through the Council.

57,544. *Mr. Kamat*: In the Amending Bill which has been introduced in the Federal Parliament to reconstitute or to reconstruct the old Institute, is there any other special feature improving the old Act, in addition to the particular feature which you just now mentioned?—The Bill was passed twelve months ago by both Houses of Parliament. It was passed somewhere about the middle of last year.

57,545. I lost sight of that, but in this amended Act, I ask what were the special features in addition to the one which you have just mentioned which were provided in order to eliminate jealousy on the part of the States, for instance?—The new Act defined clearly the new Constitution and the method of control. The powers and functions were somewhat modified. Provision was made that the organisation should be independent of the Public Service Act. Clauses were introduced regarding fees, appropriations, superannuation and so on. Beyond that there were few alterations. They did not pass a new Act, but amended the old Act.

57,546. You mentioned an Endowment Fund?—That is under a separate Act.

57,547. An Endowment Fund for sending students abroad for training as research workers?—Yes.

57,548. That is a Federal Endowment Fund, I take it?—Yes, of £100,000.

57,549. When students are trained under a Federal Fund, do you allow that they should be taken up in the States if necessary, or are they reserved for Federal service only?—That is a very difficult question. It is under discussion between our Council and the States at the present time. Western Australia has quite legitimately claimed that if we select a boy from the Western Australian University, we ought to give that State the first call on that boy. We are trying to do that, but we can hardly agree definitely that the boy whom we have trained and paid for should necessarily go back to the State, if we feel that he can do better work nationally in another State. We have agreed with the States that, as far as practicable, we will try to arrange that their own lads go back and do work in their own particular part of the Continent.

57,550. So that you find a knotty point there. May I ask also, in this connection, whether the States have contributed to this Endowment Fund in any manner?—No.

57,551. It is purely Federal?—Yes.

57,552. You think a large fund of this character coming solely out of Federal funds is of immense importance to keep up the continuous stream of properly trained men for research work?—I do. It is vital, I think.

57,553. It is not only necessary to have research stations, but to keep up this flow of competent trained men?—Yes. The greatest disability at the present time is the supply of men.

57,554. If you have a Federal Fund, do you agree that it should be intended not only for agricultural advance, but also for the training of young men?—Quite so.

57,555. *The Chairman*: Is there nothing in the nature of an indenture between the graduate who is chosen for training and the Federal Authority? Is there nothing to prevent a man after he is trained from going off to Timbuctoo?—He has signed an agreement that at the end of two years' training he will put his services at our disposal for a minimum period of three years at a minimum salary.

57,556. Has that legal force?—No, but we are picking men only after very careful discussion.

57,557. If a man does not do it, it means you have chosen the wrong man?—Exactly, that we have chosen a bad type of man.

57,558. *Sir James MacKenna*: Do the Members of the Executive Committee or of the Commonwealth Council get any honorarium?—The members of the Executive are paid.

57,559. *Professor Ganguleé*: There are three such members?—Yes. The Members of the Council also get five guineas a day when they are actually sitting, plus travelling expenses, on a scale approved by the Government.

57,560. *Sir Thomas Middleton*: What about the State Committees?—They are entirely honorary, except that if a member of a State Committee is asked by us to go and make any enquiry he gets his travelling expenses plus a daily allowance to cover board, etc., but no fees other than that.

57,561. Your fund is not only available for agriculture, but for all industries in the Commonwealth?—Yes, practically for everything outside Public Health.

57,562. Has there been any criticism of the allocation to agriculture as distinct from the allocation to engineering, let us say? Engineering has had none, and has in no way complained.

57,563. What about geological work?—We have one very important appointment in geological work which is operating well, but it is recognised generally that the crying need in Australia at present is agricultural research.

57,564. *Dr. Hyder*: According to the new agreement which Mr. Bruce is negotiating with the State Premiers, your Commonwealth makes over certain sums of money annually to the State Governments, does it?—Not in that form, so far as research is concerned. We have certain Commonwealth funds at our disposal and we have certain committees at work. We discuss with those committees and with heads of State departments where work can best be done. If we come to the conclusion that, say, a State research station in New South Wales can do work in connection with a particular pig disease better than anywhere else, we enter into an agreement with that department to assist in that research and we hand over our contribution to that department.

57,565. Not in regard to the allocation of the funds which you control, but as regards the general question of Federal and State finance, what is the position? Does the Federal Government make over certain annual contributions to the different States?—An arrangement in force for many years past has now been terminated, and the methods to be adopted in the future are, I believe, now under consideration.

57,566. We have a worse position in India. The States there have to contribute to the Central Government. The States in Australia do not have to do that?—We do indirectly, very heavily, but not directly.

57,567. *Mr. Kamat*: There is one point about the State committees. Did the Federal Government have the power to nominate two members to the

State committees?—No, only the Chairman; and that was done after consultation with the authorities in the States. We discussed with Government men and with scientific men in each State to determine the kind of man who would be suitable and who would be welcomed by the people of that State. We then recommended to the Commonwealth Government that that man should be offered the chairmanship. That is the only Commonwealth nominee to State committees.

57,568. I would like to know whether, under the new Act, this principle of nomination by the Federal Government is retained, or whether it has been found unworkable?—No, that is exactly what we do, and it has, I think, been entirely successful. We have had no trouble with this federal nomination of chairmen.

57,569. It is not resented by the Minister of Agriculture in the State? —No, the State Government has the power to nominate three members to the State committee.

57,570. But that is their inherent right, is it not? It is not in consequence of the nomination by the Federal Government?—That is merely a provision under our regulations; the Act does not prescribe it. The State has no inherent powers in the matter. The Act prescribes that there may be State committees, and the Executive recommended how State committees should be constituted. We prepared those recommendations with a view to securing the whole-hearted co-operation of the States and to make the States feel that they had a definite part to play in the organisation. The only thing we said we could not agree to was the State nomination of the Chairman, because under our Act the Chairman becomes a member of our Council, and if the States elected their own Chairman we might find that six members of our Council were all engineers, for instance. It would almost certainly be a hopelessly unbalanced Council. Therefore, in order to secure a balanced Council, the Government approved that we should make the nomination for the Chairman in each State after consultation with the State authorities. Then the regulations which we drafted, and which are not a part of the Act, laid it down that the rest of the Committee should consist of three representatives of the State Scientific Department appointed by the State Governments; three from the State University, nominated by a national scientific body known as the National Research Council; three representatives of industry in that State, nominated by the preceding six, plus such other men as might be co-opted from time to time with the permission of the executive, and because of some special services that they might render to the Committee. That is the Constitution of State committees. The only Commonwealth Government nominee is the Chairman. All the rest are State men.

57,571. *The Chairman*: Are you carrying on research into animal genetics? —Not yet. Dr. Finlay visited Australia; an Australian by birth and trained there, receiving subsequent training in America and Great Britain. He has achieved considerable fame in animal genetics and was brought out to Australia early last year by the Royal Agricultural Society of New South Wales. We secured his services temporarily to make a report on the stock position in Tasmania. That report was just complete when I left Melbourne. It has not yet been decided whether Dr. Finlay shall be offered a position to carry on work in animal genetics or not; although such has definitely been suggested.

57,572. Does the cattle industry in Australia think in terms of many breeds?—Yes, and indiscriminate breeds very largely. There is no doubt that the industry is in a deplorable condition up north.

57,573. Do you regard the research work necessary for an improvement in that position as belonging properly to the Federal field or to the States? —Nothing material has been done by the States in this direction. I think it has been definitely decided that it is our field; in fact the Australian

representative on the Imperial Economic Committee has urged that that is a problem of first importance for our Council.

57,574. Are we thinking of the same thing?—The fundamental problems of genetics is one thing. The actual improvement of breeds is another. I was thinking of the fundamental work.

57,575. Would the improvement of breeds be left more to the States?—That is left to the States, yes.

57,576. Are the States still jealous of each other in Australia?—I do not think it is as bad as it was, but there is no doubt it still exists, as between two States, at any rate.

57,577. Are the States jealous of the Federal authority?—I think so, particularly certain States

57,578. I ask because I wished my colleagues to learn how much magic there is in your wand.

The Witness: With regard to the point you raised a moment ago, there were two resolutions carried at the Agricultural Conference and bearing upon the question, as follows:—

> "*Animal Genetics.*—The genetic analysis of the economic characters of livestock, including the meat quality and milk yield of cattle, wool quality and yield of wool and carcass of sheep, egg and meat quality and yield of poultry and the like constitute a group of research problems which are of national importance and require highly specialised research for their solution, and form an appropriate field for Commonwealth investigation.
>
> "*Animal Breeding.*—The application of existing knowledge of principles to the breeding and improvement of farm animals. This field of work should be left to existing State Departments of Agriculture."

57,579. *The Chairman*: Will you send me that whole report?—Yes.

(The witness withdrew.)

The Rev. Dr. E. M. MACPHAIL, C.I.E., C.B.E.

Oral Evidence.

57,580. *The Chairman*: Dr. Macphail, you are ex-Vice-Chancellor of the University of Madras and ex-Principal of the Madras Christian College?—Yes.

57,581. The Commission is extremely interested in the question of whether it will be possible to suggest directions in which the Indian Universities can play a more active part than they do at present in agriculture in the widest sense; and it is in that direction that we hope you will inform us to-day. I do not know whether you would care to make any statement?—I am very sorry I was not able to submit any written statement, but I have been travelling about, and I got your invitation in Paris, and was not able to write out anything. The fact is that I do not know I have really very much to say to the Commission on the subject, because in Madras we have only very recently brought the College of Agriculture into the University. It was a separate Government institution and had nothing to do with the University until about five years ago. I was at Home at the time. At that time it was affiliated to the Madras University. It now has its representatives on the different University bodies, and we give a degree. If I remember rightly, there is a very small Faculty of Agriculture consisting of two members. That is about all the connection we have with agriculture directly, except in so far as we are training people who may take up agricultural work.

57,582. Is a Madras a residential University?—No. It is an affiliating University. The University of which I was Vice-Chancellor aims at becom-

ing what I might call a localised University; that is to say, it will consist entirely of the colleges in Madras when it is complete; but at present it has affiliated to it colleges scattered over the whole of the Presidency, with the exception of the northern colleges which have recently been cut off and formed into a separate Andhra University.

57,583. Are you familiar with any other Universities in India?—I know something about them. I was on the Inter-University Board, and I attended the conference at Simla in 1924.

57,584. Have you anything to tell the Commission as to the means which might be taken to bring the Universities into closer touch with agricultural matters, or to place the Universities in a position in which they might make a larger contribution to the solution of research problems that lie before India?—I have been thinking over that matter. The difficulty is with regard to the old Universities. Almost all the teaching work was done in the colleges, and it is only very recently that anything of the nature of University chairs has been instituted. In Calcutta they have a large number of post-graduate courses, but in Madras they are only beginning that. When the University was re-organised four years ago, the idea was to start a number of University professorships, but they are only making a beginning with regard to that. One of the chief ideas with regard to the Reforms which were brought in was that there should be a great development of science. I have not been much in Madras for the last two years, but when I retired from the Vice-Chancellorship they were just beginning to start the idea of having a Science Institute where there would be a number of branches of science taken up and developed. It would be in that connection only that the University might do something for agricultural work. It would be chiefly in the way of encouragement of agricultural chemistry and things of that sort. The fact of the matter is that there is a difficulty with regard to finance; it is want of money. Very great difficulty has been found in getting money sufficient to endow chairs or to pay the salaries of competent men. I do not know how soon it is likely to be possible to develop on the lines of having a Professor of Agriculture, such as we have in Edinburgh University.

57,585. What do you think of the idea of instituting a degree of rural economics?—I rather think we have already a degree of Bachelor of Science in Agriculture in Madras. I have not my calendar with me, and I cannot trust to my memory.

Mr. Noyce: That is given to the students of the Agricultural College. It is not quite the same thing as that to which the Chairman is referring.

57,586. *The Chairman*: That is not the same thing as a degree of rural economics?—You mean you would have separate courses for it.

57,587. I suppose that would be necessary?—What occurred to me was that there might be diplomas. The danger, to my mind, in connection with all University courses in agriculture is that a man who takes a degree in agriculture may simply look upon it as creating an opening for a career for himself in something else. Take, for example, the men who have taken up biology with us. They pass a degree in biology, and the next thing you find is that they have become lawyers or have gone into Government service. If one could get the people of India to look upon Universities as places which provide learning rather than places for providing degrees, and if one could get it into people's minds that they might attend classes without the desire of taking a degree, or of graduating in anything, a great deal would be done, but it is a very difficult thing to do. Hitherto, the one idea in connection with University courses has been that of taking a degree with a view to a future career in some department of public life.

57,588. Has it occurred to you that the Government of India might make some contribution towards the financing of a chair of Agriculture

in a particular University?—That has occurred to me. I think if anything of that kind is going to be done it will have to be done through the Central Government. The difficulty is that Education is a transferred subject, and there you have the danger of interfering with the Provinces. On the other hand, I do not see how the Provinces are going to supply the necessary funds for anything of that kind unless they get it from the Government of India. I think it must be a centralised scheme.

57,589. Do you see any signs of inter-University organisation appearing? Do you think the Universities are together in these matters at all?—We had a conference in Simla in May 1924, and it was a very successful conference. It was called by Government, and at it we appointed an inter-University Committee, which body met in Bombay in 1925. I was the Chairman of the Committee, and most of the Universities joined in. Calcutta held out for some time for some reason, and I think Allahabad and Lucknow kept out, I do not know why; but all the other Universities came in, and we formed this Inter-University Board with a Chairman and Secretary. It was not decided at that time where the office was to be. We came to the conclusion, both at Simla and at the meeting of the body, that we had to go carefully, because the Universities were extremely jealous of their autonomy; in fact that was why, I think, Calcutta kept out At Simla there was a certain feeling of alarm that there might be interference on the part of this central body with the individual Universities. It was quite unfounded. I think it was also borne in upon us that it was extremely difficult to standardise examinations. Some Universities are notoriously much more lax in their examination standards than others. Certainly we do not want to bring down the higher standard, and the Universities with lower ones were afraid of interference.

57,590. Is there a general tendency towards a progressive relaxation of the standards of education?—There has been, I am afraid. It has been a thing against which I have had to fight all my life in Madras. We have been trying to keep the standard high, but there is always a danger, because there is a sort of feeling on the part of people that if the standard is stiff then boys are "plucked," and they are looked upon consequently as being prevented from entering on a career in life. It is a great temptation with a popular body to favour a lowering of the standard. I do not know whether it has been very marked, but I think it is a thing which has to be fought against steadily, the tendency being to lower the passing mark and generally to increase the number of passes. In Madras we have succeeded in keeping up the standard to a very considerable extent.

57,591. *Professor Gangulee*: Reference has been made to the teaching of rural economics. I think Dr. Slater when he was at the University of Madras, introduced a course of rural economics in the B.A. class, did he not?—What Dr. Slater did was to get a number of students to conduct rural local surveys. The results were brought out ultimately in a book by him. Several other students took up the same thing. My own belief is that it would be far better for that kind of thing to be encouraged by Government than for Government to do it itself. I think it is much more likely that information would be obtained by students who belonged to the different villages and who went about and who knew the people. They would be able to give much more valuable information than if the Government collected it, as it would be suspected that the Government had some reason for doing so; whereas, if the work were done by students, I think very valuable results might be obtained.

57,592. Has Dr. Slater's work been discontinued?—Dr. Slater left. He was only appointed for five years, but the kind of work he introduced has been done by other people. One of the lecturers in the Christian College did a very extensive piece of survey work in Malabar and sent it up as a thesis for the doctor's degree just before I left. So that the work has

been carried on, and I think would be further carried on if it received a little encouragement.

57,593. Your suggestion is that economic surveys could be better organised in the Universities through the help of Government?—They would be better done through the Universities, certainly; and the Government might encourage it by giving grants or prizes for the best survey, something to encourage the men to do the work.

57,594. *Sir Thomas Middleton*: You heard the last witness refer to the difficulty of getting biologists in Australia. He said the reason was that biological teaching was neglected very largely. I am afraid this has been the case in India in the past, but in recent years there has been a distinct improvement, I believe, in the biological teaching in colleges?—Biology was introduced in Madras University the year I went out, in 1886. The Governor, Sir M. Grant Duff, was very interested in natural science, and he encouraged the establishing of a Biology Professorship in the Madras Christian College and in the Presidency College, and ever since 1886 biology has been taught in those two colleges. I do not know whether it is taught for the degree in any other college, except perhaps in one or two where it has been introduced; but natural science has been introduced for the last fifteen years as one of the subjects in the Intermediate Examination, and it goes with chemistry and physics. A very large number of students take it up because it is preparatory for going into the Medical College.

57,595. It enters into the final examination, also, does it not?—After the Intermediate you specialise, and you can specialise in natural science. In the Christian College we have courses in botany and zoology. In the Presidency College they have botany, geology and zoology.

57,596. You referred to the fact that when young men take their degrees in biology and geology they find there is no work, and therefore go in for law or some other subject?—That is so. There is no special opening for them along the lines of biology or geological research. One man, I know, got into the Museum, and another one is now head of the Fisheries.

57,597. Did the Agricultural Department not absorb many of them?—Not very many, I think.

57,598. Has a system of intermediate colleges been introduced in Madras?—It has not been introduced. We had them before the Sadler Commission. We had a number of Intermediate colleges which only taught up to the Intermediate, and we have a number of these still. There was an attempt made to elimate them from the University by the new Act, but it did not succeed, and there are still a number of these Intermediate colleges.

57,599. The position has not changed since the Sadler Commission reported?—Not in practice.

57,600. *Mr. Noyce*: I take it, then, it is your view that it is not really possible to bring a non-residential University in India in closer touch with agriculture, to any marked extent?—I do not think so myself. I do not see how it is to be done. Of course, you have landowners. A great many of the students who come to the colleges own land, and it might be possible to devise some means of interesting them in agricultural problems, but I am afraid that the majority of the students who come from the land to the Universities do so, not with the purpose of becoming agriculturists, but with the purpose of engaging in other pursuits. That is the difficulty. There are occasionally men who are interested in their lands, but most of them have not that interest.

57,601. It would probably be equally difficult to give anything like an agricultural tinge to a residential University, as those are all in urban centres? Is not that so?—Yes. What you want to do is rather to develop primary education. That seems to be the great need for improving agriculture. If you could develop elementary education, and get the people in

the villages able to read and write, then you would be able probably to do something in the way of giving information. With regard to the question of improving hygiene and general well-being, when we had a publicity board in Madras, we used to get people to come and give us an account of their work. I remember one extremely interesting talk we had from a man from the Agricultural Department. He told us especially about green manures. We had these things printed in the vernaculars. During the War, when the Publicity Board was set up, we had established a system of honorary correspondents. We had thousands of them all through the Presidency to whom we sent our literature; and it occurs to me that more might be done, in that way, in spreading knowledge amongst the villagers with regard to public health and with regard to agriculture by means of vernacular leaflets, which might be sent to accredited persons like schoolmasters or sub-assistant inspectors and local people of that sort, who might try to assist the ryots to understand things. I think something of that kind could be done with regard to the ryots, but it would be better still if he could be so educated up to be able to read those things for himself.

(*The witness withdrew.*)

The Commission then adjourned its public meetings till 10.30 *a.m. on Thursday, the* 14*th July, at Cambridge.*

Thursday, July 14th, 1927.

CAMBRIDGE.

Present:

The Marquess of Linlithgow, D.L., (*Chairman*).

Sir Henry Staveley Lawrence, K.C.S.I.
Sir Thomas Middleton, K.B.E., C.B.
Mr. H. Calvert, C.I.E., I.C.S.
Professor N. Gangulee.
Dr. L. K. Hyder.
Mr. B. S. Kamat.
Mr. F. Noyce, C.S.I., C.B.E., I.C.S.

Mr. J. A. Madan, I.C.S.
Mr. F. W. H. Smith } *Joint Secretaries.*

Professor T. B. WOOD and Mr. F. L. ENGLEDOW, M.A., School of Agriculture, Cambridge University.

Memorandum on Training for Research and Administration in Agriculture.

The official questionnaire circulated by the Royal Commission is framed predominantly upon strictly Indian considerations. It does not, therefore, give opportunity for a statement of general questions of agricultural training with which the School of Agriculture at Cambridge is specially concerned. Accordingly this memorandum has been prepared as a presentation of specific considerations of importance in connection with agricultural training.

1. The Scope of Agricultural Training at Cambridge.
2. Training for Research.
3. Training for General Agriculture and Agricultural Administration.
4. Recruitment in England.
5. The Policy of Agricultural Training.
6. The Training of Indian Agricultural Students in Cambridge.
7. Memorandum for Candidates for the Diploma in Agricultural Science and Regulations for the Ph.D. Degree (by Research) and certain other pamphlets. (*See* Appendix.)

1. *The Scope of Agricultural Training at Cambridge.*

During the past few years the range and number of agricultural students have been continuously augmented. Additions to the teaching and research staffs and to the equipment have made it possible to create an organisation adequate to the increased demands for teaching and research. This organisation provides for three principal forms of training:—

(i) The B.A. Degree in Agriculture—a three years' course in practical agriculture and the sciences which find application in agriculture. This is an ordinary (as opposed to an Honours) degree: but it differs from the ordinary degree of the University. It is of higher standard and affords for Agriculture what the M.B. examinations afford for Medicine.

(ii) The Diploma in Agricultural Science. Normally, this is taken by men who have first passed Part 1 of the Natural Sciences Tripos. It occupies two years. The first is spent in a study of practical agriculture and the application of the cognate sciences. In the second year

the candidate specialises under a personal Supervisor in some selected branch, e.g., crop husbandry or plant breeding or mycology.

The diploma course thus seeks to equip a man in the fundamentals of the sciences, in the practices of agriculture, and in the knowledge and technique of some special branch. The memorandum mentioned in § VII fully explains the regulations for and ambit of the course.

Modern standards of agricultural technology make such an all-round training essential for the recruit.

(iii) Advanced Training and Research for men who have had some research experience.

In every branch of agricultural science progress is now swift. Many men, after some years of work overseas, feel the need of a period of study and research in which they may re-equip themselves. Some have spent a single year in Cambridge for this purpose -a shorter period is not of practical value. For them efforts are made to provide specific facilities. While this is done with pleasure, it is not always done without inconvenience. For both the members of the staff here and for the visitor himself, at least six months for pre-arrangement is highly desirable.

For those able to spend two or three years the degree of Ph.D. (or M.Sc.) may be possible. [Recent candidates have been Mr. V. K. Badami and Mr. K. Ramiah—now in residence.] The Regulations mentioned in § VII explain conditions of admission. If other Indian students are likely to seek admission to the Ph.D. course the regulations and circumstance attaching to it should be made far more widely known to the departments and individuals through whom students are sent.

To meet the increasing demand for advanced training in the School of Agriculture a Director of Advanced Students has been appointed. He exercises general control and arranges for personal technical supervision of every advanced student by an appropriate member of the teaching or research staffs.

2. *Training for Research.*

The science schools of the University afford courses of Honours standard in all the sciences and thus give, through the Natural Sciences Tripos, wide facilities for fundamental training in pure science.

The School of Agriculture is able to give facilities for advanced teaching and for research in:—

Plant Breeding (Genetics, Cytology, and the Policy and Practice of Breeding).
Plant Pathology (Mycology, Entomology and the Chemistry of Fungicides and Sprays).
Statistics (the need for which is now very strongly felt in every department of scientific and agricultural work).
Animal Nutrition.
Animal Physiology (reproduction and growth).
Animal Pathology.
Crop Husbandry.
Animal Husbandry.
Agricultural Economics.
Poultry Husbandry and Nutrition.

These subjects may be pursued by immediate post-graduates (for the diploma) and by men of previous research experience (Ph.D. degree standard).

3. *Training for General Agriculture and Agricultural Administration.*

The courses for the B.A. degree are intended to equip the farmer and landowner. Corresponding courses exist for forestry and estate management. Men reading for the degree may, either in their three degree-years or by residing for a fourth year, attend additional courses in poultry husbandry and nutrition and in tropical agriculture.

4. *Recruitment in England.*

The type of man best equipped for the overseas agricultural services is the man who combines a sound training in the sciences, a good acquaintance with agricultural practice, and specialised knowledge in his own technical branch: Tripos men can be drawn to agriculture if the conditions are as good as in the commercial and other fields of occupation to which Tripos men normally go. In the past, demands for agriculturists and foresters have come in a purely spasmodic manner. There has been no attempt to forecast requirements, either numerical or categorical. A service in which openings are so irregular and undiscernable is naturally viewed by the young science-graduate with misgiving. If recruits are expected from the University the strength and technical nature of on-coming requirements should be constantly estimated and made known to those through whose hands men in training pass.

5. *The Policy of Agricultural Training.*

There has appeared, in recent years, an altered view upon technical training. Specialisation has become inevitable, but early specialisation is not, therefore, of necessity a sound policy. Demands for "specialist courses" are sometimes made. In many cases the candidate for a specialist course lacks broad training in fundamentals. Upon such a one a "specialist course" is wasted: it may indeed be harmful. It appears desirable to sound a warning. Experience has again and again proved that the competent agricultural technologist cannot be produced without a thorough grounding in scientific fundamentals. Accordingly, it is suggested that fundamental training and not specialist teaching should be the foundation of policy in agricultural training. A man well equipped in the sciences and the fundamentals of practice will speedily acquire for himself the specialised and local knowledge his specific appointment demands. A man who has specialised narrowly and upon a poor general foundation may start successfully. But he cannot be expected to build up a career of usefulness in the varied field which must await every overseas agricultural technologist.

6. *The Training of Indian Agricultural Students in Cambridge.*

The following observations are made in the light of past experience. They are of great importance to both the Indian student and the teachers and administrators of the University:—

(i) Even in England the peculiar dual constitution of Cambridge—a University and the Colleges—is often misunderstood. Applicants experience much difficulty through ignorance of this constitution. Where communication is a matter of some weeks these difficulties are very serious. The High Commissioner's Office in London should establish a closer liaison with the University and make itself thoroughly acquainted with the circumstances of teaching and administration. It would, further, be a great help if an old Cambridge man in the Indian Agricultural Service could act as adviser to Indian students intending to study agriculture in Cambridge (whether the B.A. course, diploma, or Ph.D.). With his advice (by correspondence or interview in India) the actual application to Cambridge could be made with far more security than is at present possible.

Professor T. B. Wood and Mr. F. L. Engledow.

(ii) The demands upon the School of Agriculture for teaching and research facilities are now very heavy. Short-notice applications from overseas—especially in the case of advanced students—have become a matter of serious difficulty. If Indian requirements could be forecast and co-ordinated the benefit to the School and the students would be very great.

(iii) Indian agricultural students who come to Cambridge have varied considerably in ability. For advanced training, facilities exist in the School for only limited numbers. Great expansion of facilities cannot be contemplated because of the inevitable detriment to teaching standards which undue expansion must necessarily occasion. Careful selection of applications in India is therefore very desirable. There is a tendency among Indian students to attempt too much. Enthusiastic in their studies and anxious to derive the utmost from their Cambridge careers, they often seek to cover too wide a field. Superficial and hasty study with no leisure for reflection are the result. While zeal in a student can, in principle, call for nothing but commendation, uncontrolled enthusiasm has its dangers, and it appears desirable to impress this fact upon students embarking on a course of advanced training or research.

(iv) Difficulties concerning admission have been discussed in (i) (*supra*). Attention is invited to § 12 of the Memorandum to Candidates for the Diploma in Agricultural Science (*sent herewith*). As will be seen, efforts have been made to ensure smooth working, but a complete review of the whole question is desirable.

APPENDIX.

MEMORANDUM TO CANDIDATES FOR THE DIPLOMA IN AGRICULTURAL SCIENCE, AT THE SCHOOL OF AGRICULTURE, CAMBRIDGE UNIVERSITY.

MEMORANDUM TO CANDIDATES FOR THE DIPLOMA IN AGRICULTURAL SCIENCE.

(*N.B.—The enclosed blue-covered pamphlet gives the formal regulations.*)

1. *The Examination.*

The examination is held once a year, in the Easter Term. It consists of two written papers and a practical or oral examination.

In addition a thesis or essay has to be presented. A candidate whose thesis does not satisfy the Examiners cannot pass the Examination.

It is no longer possible to take a Diploma in Agriculture by examination only.

2. *Entrance.*

Names of candidates must be sent by the tutor to the Registry not less than three weeks before the day fixed for the beginning of the examination together with:—

The fee,
The subject in which the candidate desires to be examined,
The candidate's essay or thesis,
A certificate of diligent study signed by the Supervisor,
(For Forestry candidates only) Evidence that they have resided for six months in a forest at home or abroad.

3. *Admission to the Course.*

A form of application will be sent to candidates:—

(*a*) To those who have taken courses and examinations prescribed by the Degree Committee—when the examination result is communicated.

(*b*) To those for whom preliminary courses and examinations have not been prescribed—as soon as they are accepted by the Degree Committee.

In all cases the application should be completed and returned without delay. The last day for application is the day before the division of the Michaelmas Term (usually about November 10th).

4. *Choice of Subject.*

The subjects are set out on p. 15 of the blue-covered pamphlet sent herewith.

Candidates should bestow great care upon the choice of subject and should seek advice from those to whom their work and capabilities are best known. There is no one best nor most profitable subject. Apart from special circumstances, the candidate will be wise to select that subject towards which he most inclines because of its intrinsic interest.

5. *Nature and Object of the Diploma Course.*

By Ordinance the course "shall extend over one academic year and shall include attendance at lectures and practical work as directed by the Supervisor, and the preparation of an essay or thesis under his direction."

The essential objects of the Diploma Course are to ensure that the candidate:—

(*a*) Learns to make proper use of scientific literature.

(*b*) Gains such a sound general knowledge of his Diploma subject as will fit him to specialise in some department of it.

(*c*) Acquires skill in the technique of his subject and especially in that department of it to which the matter of his thesis is related.

(*d*) Carries out practical and investigational work of a kind and to an extent that will enable him to study and present his thesis-subject with critical discrimination.

(*e*) Gains experience in the presentation of scientific matter.

(*f*) Learns to think and work for himself.

The degree Committee naturally recognises that only in exceptional cases, as of candidates who have already been engaged in research for some years, can the investigational work of the Diploma year yield final experimental results. This work is, in fact, to be regarded as an apprenticeship.

6. *The Thesis.*

Choice of a thesis-subject is of the first importance. It is for the candidate to choose. He must consult his Supervisor as to the precise scope and form of the subject; but unless he himself is impelled by interest to some definite subject he is not likely to prove a successful student. The subject must be such as can be profitably studied with the resources at the candidate's command.

Successful theses have ranged from some 8,000 words to over 50,000. No limits are set and none can be advised; but it is important to remember that mere length is no recommendation.

Diagrams, appropriately used, are an asset and a bibliography of cited papers should be included.

Professor T. B. Wood and Mr. F. L. Engledow.

Simple compilation of abstracts of papers, however relevant to the subject, is of little value. The presentation of results, whether of original investigation or of the published work of others, must bear evidence of sound understanding and critical study.

On excellence of presentation and general care and skill in dealing with the material and evidence, the candidate's success largely turns. Accordingly a generous amount of time should be set apart for the compilation and arrangement of matter and the final writing of the thesis. Examiners pay close attention to literary form.

The date of handing in the thesis is given in 2 above. By regulation the thesis must be printed or typewritten. Candidates should realise that typewriting and final correction may take two or three weeks. The manuscript of the thesis ought therefore to be completed by the beginning of the Easter Term.

7. *The Supervisor.*

Advice and help are willingly given by Supervisors. But help should be sought only when necessary and in such a manner as not to render the Supervisor's task unduly burdensome. Reading and investigational work should be pursued under the guidance of the Supervisor, but primarily on the candidate's own initiative. It is entirely outside the Supervisor's duties to find a thesis-subject for the candidate who, with clear ideas and motives of his own, should simply look to the Supervisor for expert advice and assistance in major difficulties.

8. *Preliminary Arrangements.*

As soon as the candidate is admitted to the Diploma Course by the Degree Committee he should start to make preliminary arrangements. The subject, *e.g.* Soil Science or Crop Husbandry, etc., must be selected and a Supervisor found. Mr. Engledow (Room 14, School of Agriculture) gives administrative assistance to candidates in these matters. Candidates who are members of the University should complete their preliminary arrangements before going down at the end of the Easter Term. For them residence in the Long Vacation is, subject to the directions of the Supervisor, usually essential.

9. *Eligibility for the Diploma Course.*

This is defined in the Supplementary Ordinances, 1926, p. 996, 2 (*a*), (*b*), (*c*) and (*d*) (reprinted on p. 13, (*a*), (*b*), (*c*) and (*d*) of the blue-covered pamphlet).

For non-members of the University difficulty sometimes arises over the interpretation of:

"2 (*c*) present to the Degree Committee of the Faculty of Agriculture satisfactory evidence of previous training in Agriculture and the allied sciences."

It is naturally impossible to define "satisfactory evidence," and the custom of the Degree Committee is to examine in detail the record and claims of every individual candidate. Broadly, they demand:—

(i) Such a training in the sciences allied to Agriculture as will enable the candidate to make full use of scientific method and knowledge in dealing with agricultural problems.

(ii) Such a knowledge of the general principles and practices of Agriculture as will make it proper for the candidate to attempt to apply scientific method and knowledge to agricultural problems.

No formal qualification (i.e., degree, diploma, or certificate save as specified in 2 (*a*) and 2 (*b*) above) is specifically accepted or rejected as satisfactory evidence. As a rule the Degree Committee will not exempt from prescribed qualifying courses (as a preliminary to the actual Diploma Course) anyone who does not hold an honours degree in Agriculture. When application has to be made solely by letter the candidate's claims should be fully and clearly specified, having in mind the broad requirements (i) and (ii) set out above. A practical experience in husbandry is not necessarily a sufficient qualification for the Diploma Course.

Normally, the Diploma Course commences in the Michaelmas Term (about mid-October). When application is by letter, particularly from overseas, it should be made at least three months before this date. Late applications inevitably occasion serious inconvenience to all concerned.

10. *Entry to the University.*

Candidates for the Diploma must be or become members of the University.

To become a member of the University it is necessary to matriculate: anyone approved for the Diploma Course by the Degree Committee of the Faculty of Agriculture is accepted by the University for Matriculation.

Admission to the University must be preceded by admission as a member of a College or as a Non-Collegiate Student. Collegiate and Non-Collegiate regulations are fully explained in *The Student's Handbook to Cambridge* (Cambridge: at the University Press: republished annually) which is obtainable from booksellers and is to be found in most University libraries.

There are eighteen colleges; and in addition, Fitzwilliam House, which may be joined by Non-Collegiate Students.

Application for admission should be made to the Senior Tutor of a College or to the Censor of Non-Collegiate Students, Fitzwilliam House. There is great pressure on accommodation in all Colleges, and it is desirable to make application twelve months before the time desired for entry. Residence ordinarily commences at the beginning of October.

It is impossible to set out here the various considerations as to choice of a College, and applicants are urged to seek the personal advice of someone acquainted with the College system.

When making application to a College candidates should also make the necessary application to the Chairman of the Degree Committee, School of Agriculture, and should make clear to the Tutor that they have done this.

11. *Fees.*

Candidates taking prescribed courses as a preliminary to the Diploma Course pay the lecture and laboratory course fees specified in the Lecture List.

For the actual Diploma Course there is a fee of £7 7s. (seven guineas) per term, which covers payment to the Supervisor, attendance at lectures and laboratory courses in the School of Agriculture, and bench fees. No rebate or remission of any kind can be made from these fees.

12. *Indian Students.*

A special Adviser has been appointed at Cambridge to help and advise Indian Students as to admission to the University. His address is—The Adviser to Indian Students, 22, Fitzwilliam Street, Cambridge. It is essential for applicants to get in touch with the Adviser as soon as possible. To this end there are sent, herewith, a copy of the memorandum from the

Professor T. B. Wood and Mr. F. L. Engledow.

Inter-Collegiate Indian Students' Committee and a Form of Application for Admission to the University of Cambridge. This form should be filled in with care and sent as soon as possible to the Adviser. Intimation that this form has been sent to the Adviser should be made to the Chairman of the Degree Committee, School of Agriculture.

Letters and replies between Cambridge and India take several weeks, and for this reason the following matters are very important:—

(*a*) Admission to the University must be completely arranged with the Adviser BEFORE the applicant sets out for Cambridge. (It is quite impossible to commence the Diploma Course or the preliminary prescribed courses until admission has been arranged.)

(*b*) Application should be made twelve months before the desired time of commencing residence.

(*c*) All applications must be in strict accordance with the regulations which govern them.

(*d*) Admission cannot be guaranteed even to applicants with the strongest claims; for in any one year the number of admissions, for the combined students of all kinds, is regulated by the available laboratory and other facilities of the School of Agriculture.

Oral Evidence.

57,602. *The Chairman*: Professor Wood and Mr. Engledow, you are both of the School of Agriculture, Cambridge University. Would you first, Professor Wood, and then afterwards, Mr. Engledow, give us the exact terms of your appointment in the University?—*Professor Wood*): I am Drapers Professor of Agriculture in the University. Under the new Statutes the University has to recognise someone as head of every department and they have recognised me as head of the School of Agriculture. I am also Director of Animal Nutrition Research Institute. (*Mr. Engledow*): I am Assistant to Professor Biffen in the Plant Breeding Institute, I am Director of Advanced Students in the School of Agriculture, and University Lecturer.

57,603. Is it your opinion that if there were, in India, in the future, a demand for the type of student that you describe in these pages, that such men would be prepared to go to India, and, if so, what terms do you think would be most likely to attract such men: long-term engagement or short-term engagement?—(*Professor Wood*): I think there would be a supply and I should think, on the whole, they would rather go for a long-term engagement than a short one. (*Mr. Engledow*): I certainly think a long-term engagement of an assured character would be preferred; but with regard to the supply, of course, a new factor is operating now, namely, the extended Service of the Colonial Office; that will create a very strong competition. Terms mean, at bottom, financial terms on the one hand; and of course what the Colonial Office offers must necessarily give us an idea of what would have to be offered in India, simply from a competition point of view. On the other hand, of course, the question of tenure and security arises, and there again what is offered in other parts of the Empire would have to be taken into account. The experience of the Colonial Office is one of very great difficulty in finding really well trained men.

57,604. Do you see signs that young men are reacting to that demand?—Slow signs, yes, but I think definite signs. The difficulty in the

past has been one of obtaining information: a man has heard in his third year, that a post is available, say, in Nigeria or at Pusa or somewhere in the Punjab; he has experienced difficulty in finding what are the conditions of service and the other circumstances he would like to take into account. The Colonial Office is making a very firm endeavour to supply that information and that is a very important thing. When the facts become better known I think there will be a reaction and young men will come forward. (*Professor Wood*): I think there has been one other difficulty; that is that one does not know, in advance, what type of men are required: I mean what subject. That reacts in this way: men come at this time of year, after they have taken their science degree; they come for advice either to me or to Mr. Engledow, asking about the prospects of an agricultural career and asking for advice as to what subject they should take. You see they have taken three or four subjects in their Science Tripos and then want to know which will give them the best chance of advancement and employment; we will say agricultural chemistry, or plant breeding, or entomology or whatever it may be. One advises them to take chemistry and next year the vacancies are all for entomologists. The chemist does not get a job, he is disappointed, and that sort of disappointment is the most desperately contagious thing you can possibly find. (*Mr. Engledow*): Yes, the Forestry services show that even more sharply; the recruitment figures have fluctuated very markedly from year to year; in a year when there have been very few appointments that has meant that in the next year students have not looked for those posts.

57,605. Is it your view that it is possible to gauge from a survey of the world market as to where vacancies are likely to occur?—It is very difficult because in our experience Government departments themselves have had very uncertain foreknowledge of vacancies. The knowledge must really come from them; they have the power of appointment. (*Professor Wood*): I think that is one of the strongest factors that has depressed the supply of suitable men.

57,606. On page 678 of the memorandum, you deal with the training of Indian agricultural students in Cambridge. Would you describe, quite shortly, the examinations that a student has to pass when he comes in: in fact, what happens to him from the moment he decides to come to Cambridge? He has to take his "Little-Go," has he?—(*Mr. Engledow*): Would it agree with your purpose if I went back even further, to the question of admission?

57,607. It would be useful?—A typical case would be of this kind: a man writes, or someone on his behalf writes, and says he would like to come to Cambridge and read agriculture. Now, first of all, it is often not recognised many times by Indian applicants that the School of Agriculture, like every other school of science or arts in Cambridge, has no power to admit to the University. Membership of the University implies first membership of a College, and that is entirely in the hands of the Colleges, which are self-governing bodies. Consequently, the first step anyone from India should take is to get into touch with a College and gain admission to the College. He will then, provided he can pass the Previous examination or "Little-Go," be accepted by the College and become a member of the University. It is not until he has done that that the School of Agriculture is really able to deal with him. There, undoubtedly, difficulties have arisen simply through lack of knowledge at the other side. One ought to point out that the pressure for admission is

extremely heavy on all the Colleges and great numbers of applicants have to be refused. As this Commission no doubt knows, a special adviser to Indian students has been appointed in Cambridge; he is supposed to be the liaison between applicants from India and the Colleges in Cambridge; but proper use is not made of that adviser because his existence even, and still less his functions, are not sufficiently known in University and school circles in India.

57,608. Does he communicate with the students' advisers in the Provinces in India or with the High Commissioner's office in London?—I think with the High Commissioner's office in London, invariably; but it is quite certain that, as we see in connection with agricultural applicants, his functions are not properly understood and his task is made more difficult. Assuming then that a College is willing to take an applicant, he next has to pass the "Little-Go"; that is merely a general entrance examination, and I cannot attempt to give you the regulations for it.

57,609. What subjects does he have to take?—That depends largely on the man. In the case of Indian students I think Latin is not compulsory, but I cannot speak authoritatively of that, because, of course, the Little-Go" is no affair of the School of Agriculture at all; it is entirely an entrance examination.

57,610. Do you happen to know whether he has to take a second European language as well as English?—Yes, I think he has.

57,611. Please go on?—Assuming he has passed his "Little-Go," then his future in Cambridge is exactly like that of a man from a school in England: he can take one of two options. If his training and his capacity are really sound scientifically, the best thing for him to take is the natural sciences Tripos, Part I, over which he may spend either two or three years; I think in the case of a candidate from India, as a rule, three years would be necessary. At the end of that time he is eligible for the diploma in agriculture, provided he spends one preliminary year in certain non-specialised agricultural course. So far he will be trained scientifically He presents himself before the Degree Committee here who prescribe certain departments of agriculture and agricultural science; he must devote one year to those and pass the necessary examinations. He is then at the end of his fourth year residence. After that he is eligible for the diploma in agricultural science, which occupies another year which is spent in one department of agricultural science. It may be animal nutrition or plant breeding; there are nine separate departments in which he can take the Diploma in Agricultural Science. That is looked upon as the ideal training for a man who is to devote himself to one of the technical branches of agriculture, for example, in a Government agricultural service. On the other hand, there is the case of a man whose capacity is not of the highest scientific order, or, let us put it in another way, whose mentality is rather of the practical than of the scientific cast, and who looks to find employment in some way or other in the administrative aspects of agriculture or in the actual farming of land. This applies equally to a candidate from an English as from an Indian school. In the case of the practical man there is a B.A. course in agriculture which occupies three years; it deals with the practices of agriculture and with the applications of the various sciences to agriculture. At the end of each year there is an examination; all three examinations must be passed, and if they are passed, the man gets his B.A. degree in agriculture. They are the two principal courses. I ought perhaps to mention another degree with which we frequently have to deal with candidates in India, namely, the Ph.D. degree. That may be taken in one of the departments of agricultural science. It involves as a rule three years' residence in Cambridge; it is taken, of course, by graduates of Indian Universities. There are a number of regulations which are

somewhat technical, and I think I need not mention them. To sum up then, we may say there are three courses; first of all, the B.A. in agriculture, for the practical man, the diploma in agricultural science for the technical or official agriculturists, and the Ph.D. which is for the post-graduate student who has already a knowledge of agriculture, a good grounding in science and a degree from an Indian University.

57,612. *Sir Henry Lawrence*: Does the B.A. in agriculture take three years from the "Little-Go" or six years?—Three years.

57,613. Corresponding to the degree in natural sciences?—Yes, but not to an Honours degree; the B.A. in agriculture is not an Honours degree; it is a pass degree, but it is on a different standing from what is called the ordinary or poll degree here; it corresponds somewhat to the medical degree.

57,614. The diploma in agriculture involves two years after taking a degree in natural science?—Yes, after an Honours degree in natural science.

57,615. The Ph.D. degree takes three years in all?—It is essentially a post-graduate course. (*Professor Wood*): If a man comes over from India who has already done a considerable amount of science in India and does not want to take the Ph.D. (perhaps because his line is not research) then he may be admitted and take the diploma in agricultural science in two years. If he can satisfy our Degree Committee that his knowledge of agriculture and his general all-round knowledge of agricultural science is good enough for him to start specialised work, then he may take the diploma in agricultural science straight away, and he can do it in two years. (*Mr. Engledow*): That is explained in the memorandum. It is necessary to emphasise that for this alternative entrance to the diploma, that is to say, not taking the Tripos first, but having an Honours degree or an agricultural degree in India first, permission is not granted by the Degree Committee unless they are well satisfied that the man is thoroughly competent. It is necessary, I think, to emphasise that to applicants. (*Professor Wood*): Yes.

57,616. *The Chairman*: On page 679 you tell us something of your experience of Indian agricultural students: you say they vary considerably in ability. What view do you form of their previous training? Has that been generally adequate?—(*Mr. Engledow*): It is difficult to answer that question directly, but I think the simplest answer is this: our general impression is that where their early training fails is in its scientific basis, in its fundamentals.

57,617. In the pure sciences?—In the pure sciences. Of course, naturally, an Indian agriculturist coming over here is entirely ignorant of English agricultural practices, as we should be if we went out there; but that is not the point at issue; it is rather the grounding in fundamental sciences.

57,618. Will you develop that a little? It is a very important point. In what direction are most of these students deficient as far as the pure science goes? Is it in book work?—No, much more, I think, on the practical side. Even those that we feel in general are not satisfactory are often extremely sound in book work. One ought not to judge too hastily, but it is necessary to judge, of course, and the impression one gets is that book work rather in the form of mere memorising has played too big a part in the training.

57,619. Too much work at the book and too little work at the bench; is that it?—Yes, and too little time for reflection over what is learned from the book, and for observation.

57,620. How about laboratory technique?—That varies very much; the advanced student who comes over is extremely good and very competent, but in the more elementary students the laboratory technique is not I think, on the whole, very well developed.

57,621. Is the average student so weak in these subjects of which you complain that he is seriously handicapped in his work at Cambridge?—I think if he were better equipped he would derive much more advantage from the time he spends here.

57,622. It takes him some time to get into the way of things here?—Yes, that is so.

57,623. Is it possible for you to supply any of the fundamental knowledge which he should possess when he comes here?—That, of course, is what we always make an effort to do; it can be done, but this brings us to another difficulty. There is a tendency, a very natural and in some ways praiseworthy tendency, to attempt to do too much during the period in Cambridge: to get a three years' degree in two years and hasten on to the diploma. That may be possible for a man with a very retentive memory and who works very industriously, but it is not in the interests of true education. That, however, is frequently the tendency; so much so, that mention is made of it in our memorandum.

57,624. Do the majority of Indian students who come here work hard?—The majority work very hard. Occasionally one has the Indian student, as one has from this country, who does not work very hard; but I would not for a moment suggest that the percentage of Indian students who neglect their studies is very much higher than that of any other nationality. (*Professor Wood*): It is not as high. (*Mr. Engledow*): No, it is probably not as high. Of course, it should not be so high, because they are, presumably, selected students.

57,625. Have you gentlemen formed views as to the most appropriate training for Indians who want to go in for agricultural science? Would you rather see their training carried on, in the main, in India? If so, would you like to see them finish their education, including their post-graduate period, in India, or would you think that experience abroad, in this country or in other countries, is a help?—That is difficult to answer in the abstract. It is largely a question of numbers. The numbers in any science school, of what nationality soever, are naturally limited. Here, for example, the pressure from advanced students is very heavy indeed. We have recently extended this building, but without any difficulty we could fill up another extension of the same size with advanced students. (*Professor Wood*): That is very much so. (*Mr. Engledow*): Therefore numbers are a consideration.

57,626. At what period in a man's career do you think the experience abroad may best come: early in his career or after he has got well into the way of his work?—I am inclined to say after he is well into his work. (*Professor Wood*): I should be very much inclined to say that the proper man to go abroad from India would be the man who has taken his degree, got a considerable amount of knowledge, and comes over as an advanced student.

57,627. He has something to measure against that which he is seeing abroad: he has a background of experience?—Yes, I think those are the people who would gain most from a spell abroad.

57,628. Do you think that type of Indian at Cambridge, men who have taken their degrees in India, is preferable?—On the whole, we get more of those than any other, I think. (*Mr. Engledow*): Yes, that is so. (*Professor Wood*): I think a small number of Indian students come over to begin; many of the men we have had have not only taken a degree in India and done a regular course of training in India, but have held some junior post.

57,629. These shortcomings in the matter of pure science apply to both categories, do they?—(*Mr. Engledow*): Yes, I think they do. (*Professor Wood*): Mr. Engledow sees more of them than I do, because most of them tend to take botanical subjects rather than to take my subjects,

but those few I have had show exactly what Mr. Engledow has mentioned, that they know a good deal about their applied work, but they do not really know the fundamentals of science which are the basis of it all; they are not sound in that respect.

57,630. How about their natural gifts for original research work? Have you formed any view on that point?—I do not think we have had anybody very brilliant up to the present. How many Indian advanced research students have we had? We have not had enough to judge. (*Mr. Engledow*): No, I think it would be impossible to judge; one must have a larger population before judging. (*Professor Wood*) I mean we have not had enough to make a fair sample. (*Mr. Engledow*): No, we could do no more than discuss individual cases.

57,631. *Mr. Noyce*: Exactly how many Indian students have you at the moment in the different branches?—In the School of Agriculture we have only one advanced student at the moment; he is a plant breeder. I do not know the undergraduate population; they do not come under me: they go through the normal course. I should think the number might amount to five at the most. (*Professor Wood*): Yes, it is quite a small number, at present three. (*Mr. Engledow*): It never has been a very great one.

57,632. *Dr. Hyder*: Three for the ordinary degree and one advanced student?—Yes, I think that is so.

57,633. *The Chairman*: Have you gentlemen formed a view as to whether the qualifications of the Indian student who comes to Cambridge are improving, are stationary, or is there a decline?—(*Professor Wood*): I do not think we have had enough experience to say. (*Mr. Engledow*): No, there has not been a sufficiently steady stream. (*Professor Wood*): In the present lot, which, as we have already said, is not large enough to form a fair sample, the ordinary degree people are below average at the present time, I think.

57,634. I was really thinking of the deficiency in pure science: whether you can see signs of that being remedied?—I do not think the ordinary degree people have done any pure science before they come, or very, very little. You see there is only one research student at the present time, so that obviously you cannot take him as a sample from which you can draw conclusions.

57,635. *Mr. Noyce*: He is a plant breeder from Madras, is he not?—(*Mr. Engledow*): Yes, and there was a corresponding one last year from Coimbatore.

57,636. *The Chairman*: Have you seen any Indian students here for refresher courses?—The present student is taking a refresher course. He took a diploma in India; his college was not then able to give degrees, but he got his college qualification. He has been a plant breeder for ten years or more now; so that he, in a sense, is doing a refresher course. He came over with the intention of taking a Ph.D. degree; but, after discussion with him, it seemed more desirable that he should take the diploma in agricultural science, and then, if all went well, go on to the M.Sc. degree which is a sort of stepping stone to the Ph.D. One did not want him to attempt the impossible.

57,637. *Sir Henry Lawrence*: You say he is from the Coimbatore College?—From Madras; he is a plant breeder in the Provincial Service.

Mr. Noyce: He is being trained to take Mr. Iliffe's place for paddy work; his training was originally at Coimbatore.

57,638. *The Chairman*: Are either of you gentlemen familiar with Indian conditions?—We hardly claim that; I have been to India; I went in the early part of the War, but I was not an agriculturist there. I took a great interest in it in so far as my duties allowed, but I was not always in the most favourable places. That is the only knowledge I can claim

of it. Later on I had experience of Mesopotamian conditions which are somewhat the same; there I was an agriculturist.

57,639. Mr. Engledow, your main work, I think, lies in plant breeding, does it not?—That is so.

57,640. What are your views as to the ideal organisation for that and cognate work? Do you like to see your workers specialise on a particular crop?—Up to a point. One must specialise because the problems in any crop are very big ones and a specialised knowledge is necessary; but I believe there is the gravest danger from over-specialisation or an early specialisation. I think every plant breeder, whatever his experience, may well work on more than one crop. If, for example, you work entirely on barley, sugarcane or paddy, the whole of your botanical and biological outlook is moulded by one crop. If you turn to the potato or groundnut, you might get some surprises, and many things which you conceive as fundamental might be overthrown by experience of another crop. Therefore, I think experience of two crops at some time or another is essential.

57,641. And it is the rule to attempt that in Cambridge, is it?—Yes, always.

57,642. *Sir Henry Lawrence*: Can you tell us what is being done to obtain men for the Colonial Service? You say the Indian Service will have to compete with the Colonial Service?—Yes.

57,643. What is the organisation or arrangement against which the Indian Service will have to compete?—It is two-fold. First of all, there is a scholarship scheme somewhat similar to that started by the Empire Cotton Growing Corporation. This latter scheme seeks men of two types: either those with an agricultural degree, or those who are graduates in pure science. They offer them junior scholarships of £200 a year, and during that year they send them, as a rule, to Cambridge for a year's advanced training. In the case of a pure science man, the training is in agriculture; in the case of an agricultural graduate it is mainly in certain of the pure sciences, notably in statistics and applied botany. At the end of that first junior year, they send them with a grant to the Imperial College of Tropical Agriculture at Trinidad. That was the scheme developed by the Empire Cotton Growing Corporation. It has been in operation for four years. Two years ago the Colonial Office decided to have a scheme of its own, and it has adopted a similar scheme. It is unnecessary, I think, to give you the details. The men they draw on are the same kind. The training is on the same lines: one year in England and one year in Trinidad. At the end of that time they go to posts in the Colonial Services. That is one side of their activities; the other side is the creation of a new Agricultural and Scientific Research Service; it is to be made one scheme for the whole of the non-self-governing Dominions; that is to say, a man who goes as an agricultural chemist and finds himself in an out-of-the-way place, say in British Honduras, where in the old days there would be no hope of promotion because the place is so small, is now part of a Service which extends to the whole of Western and Eastern tropical Africa, and if his work is good in British Honduras he may get promotion and find a superior post, say, in Nigeria; so that the prospects of promotion are very much improved. In addition to that, the scale of emoluments is made favourable, with the intention of getting a really good type of man.

57,644. Do you know what the scale of emoluments is?—It is under review.

57,645. The candidates for those appointments will be principally derived from men who have taken the science degree and the diploma in agricultural science?—Yes, I hope a good many of them will be.

57,646. Men who have already done five years in Cambridge will then have another two years training?—No, in the case of a Cambridge man,

probably he will have spent here, we hope, three years in the normal way, then a year in advanced work, then a year in Trinidad, making five years. Our feeling here is very strongly that a young man destined for overseas employment should not spend too long in a University atmosphere. It is very bad for such a young man to spend say six University years being taught and being dependent; five years is quite enough. I imagine that five years is likely in time, to be the period; that is to say, from the day of coming up to his University, whether it be this, or Edinburgh or some other University, to the day of leaving Trinidad and taking up a post will be five years.

57,647. What would be your advice to the Government of India: to establish a similar system of scholarships and to announce beforehand how many appointments of such scholarships will be made year by year?—Subject to their requiring men in sufficient numbers. Undoubtedly there is great difficulty in getting the men. This goes back to a big question which perhaps I ought to mention. It has been the recent experience of all Universities that there is a great dearth of biologists, botanists, zoologists and so on. Of course it is to the biological side that agricultural services have to look for their recruits. When you go back to the reasons for this dearth of biologists, you have to go a long way. Biology is not taught in the schools in the same way as chemistry, mathematics and physics are; it is more difficult to teach. Then again, the openings in industrial chemistry and for physicists in industry have been so good that very great numbers of men have been attracted away from biology into chemistry and physics, so that, as I say, the experience in all Universities in this country has been that there is a dearth of biologists. One of the things to which the scholarship scheme of the Colonial Office must address itself is the encouragement of an interest in biology; it must be demonstrated to young men that biology does offer a good opening in life.

57,648. Has that to be demonstrated to the headmasters of public schools too?—That is most essential.

57,649. Is the University doing so?—It is doing its best. It has no definite machinery for the purpose; there is no very formal connection between the Universities and the schools; but, in so far as it can exert its influence, it is doing so; but, of course, the competition from the business world is very hard to over-ride.

57,650. For men with biological experience is there a demand from the business world?—By no means so great as for chemists and physicists.

57,651. Will that demand open up?—Not, I imagine, for some years.

57,652. *Sir Thomas Middleton*: The course of study which you have put before us, Professor Wood, is, I think, the result of evolution depending upon long experience; is not that so?—(*Professor Wood.*) Yes, certainly it is.

57,653. Would you indicate the directions in which the curriculum of studies has been altered in recent years?—Our first big alteration took place about 1907. Before that we had no degree in agriculture; we had only a diploma examination, and when a student came up to Cambridge with the intention of doing agriculture he was advised to learn his sciences, going for general elementary science to the same lectures, broadly speaking, as the medical students. The result of that was that a small number of agriculturists started off doing the ordinary chemistry, physics and biology with the medical students; they lost themselves completely and one never used to see them again. What it came to was this, that a man who comes up primarily to do agriculture wants really to see the agricultural bearing of his work straight away, or else he deserts agriculture. So, in 1907, the University consented to a change; the change was that we in the School of Agriculture should give courses corresponding to the course in elementary chemistry, botany, physics and so on, that is given for the medical students,

giving those courses in our own building with an agricultural bias from the very first. I do not think it is exactly logical, but we found it was the only method that would really keep our agriculturists together. The man who comes up really intending to do agriculture, agriculture being his main interest in coming to the University, is generally of the landlord class or the farming class, and he feels he does not want to spend even one year doing pure science with no agricultural bias. Directly after 1907 we started teaching elementary science with an agricultural bias and that turned out to be most successful; instead of three men out of four who came for advice about agriculture being lost to agriculture and going off without doing any more, practically every man who starts now pursues the subject right through; our attendance is good: about three-quarters of our men who start out with that end in view ultimately get the agricultural degree. I think that is the most fundamental change we have made.

57,654. That is with regard to the ordinary degree?—Yes. Then with regard to the diploma, the examination used to be in two parts, the first part being mainly on scientific subjects and the second part mainly on applied subjects. Then the University made a regulation which excused the scientific subjects in the first examination to men who had already taken an Honours degree. The result of that was that a man who had taken an Honours degree in the Natural Sciences Tripos was practically excused the first part of the diploma and took the second part of the diploma after one year's work. That was the system that was followed practically up to the beginning of the War. It certainly produced a lot of very good men; I mean men who made their mark in India for instance. When after the War we thought it was rather a short training, just one year in agriculture, and we made it two years. As Mr. Engledow has explained, a man now who wants to take his diploma after he has done his science Tripos works for one year after his degree on a course prescribed according to his special needs by the Degree Committee, passes his examination in that, and then in his last year he specialises on one particular branch of agricultural science.

57,655. *The Chairman*: How did your course of estate management fit in with what you have been describing?—That goes on all fours with the pass degree in agriculture. It fits in in this way, that during the first year the estate managers and the agriculturists take exactly the same subjects; they all go together in the first year. After the first year they can branch off into agriculture or estate management or forestry. They all three begin exactly the same and they branch off after their first year; they still have some common subjects, but there are special subjects for each of them.

57,656. *Sir Thomas Middleton*: You have, in effect, three courses leading on to the ordinary B.A.?—Yes, the three courses beginning in common for the first year and branching out afterwards.

57,657. To go back to the Tripos men: how many subjects is it now usual for the well-prepared student to take in his Tripos?—Four is the rule. (*Mr. Engledow*): I am afraid three is becoming now more common, possibly owing to the extension of the subjects. (*Professor Wood*): Certainly more take three now than used to; everybody used to take four.

57,658. I do not think that is quite correct. I remember the University when three was a common number; three for the best students and four for the doubtfuls was the policy?—(*Mr. Engledow*): That had altered in my undergraduate days when four was quite common for a scholar of a College.

57,659. You are really reverting to the previous practice?—Yes.

57,660. What is now the usual time for the well-prepared British student to take Part I of the Tripos? Is it the end of the second year or does he go on to the end of the third year?—A well-prepared man, at the end of the second year. In saying that one must remember that as a

well-prepared man one counts the one who gets an entrance scholarship, and he will have a fair grounding in some of his subjects when he comes up to the School.

57,661. That means that the complete course takes him four years if he follows on with the diploma?—That is so.

57,662. Do many men who take the ordinary B.A. proceed to take up a diploma course afterwards?—(*Professor Wood*): Yes, quite a number of them. They get very much interested in some particular branch while they are doing their B.A. degree and then they stay on and take a diploma. Those people are allowed to take it in one year. I mean, if they have got their B.A. degree in agriculture, that is supposed to be evidence that they have got an all-round knowledge of agriculture and agricultural science, and they are admitted to specialise for one year in one branch and take the diploma.

57,663. Have you had enough samples to express an opinion as to the quality of these diploma men as compared with the Tripos men?—(*Mr. Engledow*): Those who take the diploma via the B.A. take it on the practical side, animal husbandry or crop husbandry. No encouragement is given to a man to attempt to become, let us say, a mycologist and take a diploma in mycology who has learned his science in the B.A. course.

57,664. You regard the Tripos as essential for the men who are specialising in a science subject?—(*Professor Wood*): It is very much more preferable, although there are exceptions.

57,665. Have you had many British students who have taken the diploma and have come back after a period of experience to pursue a Ph.D. or an advanced course?—Yes, a few of them. The Ph.D. has not been going long enough, first of all, for them to know enough about it, and, secondly, for it to accumulate sufficient numbers; we have not had more than one or two who have come back and taken the Ph.D.

57,666. That is the type of student you get from India, the student who has taken an ordinary degree, has gained some experience in India, and then comes to you for an advanced course?—Yes.

57,667. I wanted, if possible, to get a comparison?—I do not think we have had enough to strike an average, but those who have come back have done well.

57,668. In going round India we found the same difficulty as that to which Mr. Engledow has referred in his evidence. Teaching in biology in Indian schools does not exist; there is, to a limited extent, teaching in chemistry and physics; there appeared to be a tendency on the part of students to neglect biology in the Universities. I was prepared, therefore, to hear Mr. Engledow's views on the preliminary training of the students of whom he has had experience, but I should have expected that the Indian student who came to this country would have been found to be much better prepared in chemistry and physics than in biology. I do not know whether either of you can tell me whether that view is correct?—I think we have had extraordinarily few Indian students who have come here to work at chemistry and physics. They nearly all come for some biological study. I have one man who worked at a chemical subject last year, but I think that is about the only Indian I can remember who took anything but biology. They are nearly all plant breeders.

57,669. It is quite clear that, from your point of view, the desirable type of student is the one who, having graduated in India, has done a few years' work, and then comes over to take the advanced course?—(*Mr. Engledow*): Quite. (*Professor Wood*): Yes, I am quite clear on that.

57,670. I was unable to discover, in India, anything that corresponds to your diploma in agricultural science; the student takes the B.A. degree, or what corresponds to the ordinary B.A. degree, and he immediately takes up a post without any post-graduate training at all. Do not you think

that, after the ordinary degree training and before a young man enters an agricultural department as an assistant, it is necessary that he should have some post-graduate training of the type which your diploma course in agricultural science gives?—(*Mr. Engledow*): I think the answer to that is that if it is contemplated that India should fall into line with the practice in this country and many other parts of the Empire, then it is essential, because no one now finds a place in an agricultural service either here or in Africa, or the West Indies, who has not had post-graduate training.

57,671. With regard to the new Colonial Service to which reference has been made, the training proposed is quite comparable to the training which you give for British students in Cambridge, in this sense, that you take the Tripos man and give him his diploma course in agricultural science not purely in British surroundings but in tropical surroundings?—That is so.

57,672. So that if we wanted some parallel in India we should have to adopt a similar method for the Indian student, giving him the training in Indian surroundings?—Is the argument quite the same? The Indian student will be going into a service in his own country while the student from this country will be going into a service in a country with which he is quite unfamiliar.

57,673. To that extent it is different, but each of them requires, before going into service, some more training than he can get in his ordinary undergraduate course?—Yes.

57,674. And it is for that purpose that we must imitate the methods that have been adopted in this country?—Yes.

57,675. It is an exact parallel with your method of training men for work in this country?—Yes, that is so.

57,676. Mr. Engledow, you indicated the desirability of the plant breeder dealing with more than one crop. I think what you had in mind was that when the plant breeder is being trained he ought to take on more than one crop and be trained on more than one crop?—Yes, that is the essential thing while he is training; afterwards it is for him to decide; but, speaking personally, I should always want to have more than one crop.

57,677. I was thinking of such a crop as paddy, and I was wondering how a man who had more than paddy improvement to attend to could get through his day's work?—It would have to be a very subsidiary crop. Of course, a man can easily find a very full day's work if he is a paddy breeder.

57,678. Suppose a young plant breeder were to start on an Indian crop on which no previous work had been done and was given a five years' period, how much would he accomplish in that period?—It would depend on his policy; I think in such a case his right policy would be to set aside all thought of hybridisation and to find out all about the crop; how extensively it was grown, what were the special features of its cultivation, what features governed its value on the market, how many existing varieties there were, were the varieties of it as grown by the cultivators already pure line or was selection the first thing. If he went about it in that way, in five years he might be at the beginnings of some useful work.

57,679. As regards hybridisation or any other work?—Yes, I suppose at the end of five years he would be contemplating making hybrids some day; he would have started some useful selections.

57,680. Fifteen or 20 years later he would be seeing some of these hybrids which he began in his fifth year?—Yes, if you say five years for the work I suggested and 10 years after that to have a hybrid ready

for first distribution. Fifteen years from the start he might have a hybrid ready for distribution. He would be extremely fortunate if he was quicker than that.

57,681. You are aware that most of the work which has been done in India is by selection?—Yes, and I imagine will remain so, and correspondingly so in Africa.

57,682. You yourself have had a pretty wide experience in handling crops; would you expect to find a wide field for selection in Indian crops which are numbered by the hundred?—It has always struck me from conversation with men from India such as we have had here and from the little I was able to see in India, that there is a very great field, because clearly many of the seed-stocks of India are by no means pure, but much mixed.

57,683. *Dr. Hyder*: Is there any idea of instituting a competitive examination for the Colonial Service on the lines of the Civil Service examination?—No, none whatever at present, I believe.

57,684. Then on what basis would these candidates be chosen?—On a rather elastic basis; certain qualifications are specified, but it has been found desirable to make that specification somewhat vague. Really it comes to this: a man must either have had an agricultural training of three years and obtained an agricultural degree or he must have had a training in pure science for three years and obtained an Honours degree in science. After that everything turns, first on the recommendations that come from his Professors and those who know him, and next upon the decision of a Selection Committee appointed by the Colonial Office; the Colonial Office relies to a very great extent indeed on the opinion of this Selection Committee. The candidates are interviewed by a committee of about half a dozen who consider the personality of the man, the likelihood that he will settle down to life in a tropical country, and the likelihood that he has got good common sense which will ensure that he applies his scientific knowledge; those things weigh very heavily, but of course it is always subject to the proviso that he has got a good degree. A man with a third class degree has no chance.

57,685. I imagine there would be two kinds of posts available in the Colonies: in the administrative agricultural service and for research workers?—That is so.

57,686. As regards degrees there are the ordinary B.A. degree, the diploma in agriculture, and the Ph.D. degree?—Yes.

57,687. Are those the only three degrees which are obtainable at Cambridge?—That is so.

57,688. You would not recommend a candidate who has only taken the ordinary B.A. degree for a research post in the Colonies, would you?—We should never put his name up unless the circumstances of the man or the post were exceptional.

57,689. Would you recommend a man who has taken the agricultural diploma? He must have taken the natural science Tripos and then devoted a year to obtaining this diploma?—Two years after Part I of the Tripos are needed to obtain the diploma.

57,690. That has been changed? I thought you could take it in one year before the War?—Yes, before the War, but you cannot now. This is a diploma in agricultural science as distinguished from a diploma in agriculture, and it takes two years.

57,691. Would you recommend such a candidate who has taken an Honours degree in natural science and this diploma in agricultural science for a research post in the Colonies?—(*Professor Wood*): In his final examination for the diploma, or together with his final examination, he has to present a thesis embodying the result of a piece of work he has carried

out under somebody's guidance, though not necessarily anything very original; from the way he discusses that you can judge whether he should be recommended for a research post.

57,692. There can be no doubt about the third man, who has got a Ph.D. degree?—Yes.

57,693. Such a man ought to hold a research post in the Colonies?—(*Mr. Engledow*): Ordinarily he will not.

57,694. He will not go?—I think not.

57,695. He will aspire to a post at one of the Universities here?—Probably.

57,696. Then we have to fall back on the next best kind of man?—I do not think it altogether fits the facts to put them in the one, two and three order of merit. I think perhaps this is the more appropriate way of looking at it: the B.A. in agriculture is the purely practical man with no scientific aspirations and no very great scientific interests. The diploma man is the keenly scientific man who is interested in the application of science to agriculture, but who is essentially a scientist. The Ph.D. represents an older man. If any of our second men had the opportunity of spending a further two or three years in Cambridge we should expect to find them naturally obtaining a Ph.D. degree; so that it is a difference of age rather than of merit between two and three.

57,697. How many years have you been here in charge of teaching, Mr. Engledow?—I did a little before the War and I have done it continually since the War.

57,698. What type of man has gone out to India for research posts?—Very few have gone lately. Before the War, of course, we had no diploma in agricultural science; the man who took the Tripos and then came to the School of Agriculture was the sort of man who usually went from Cambridge.

57,699. I suppose you are not familiar with the details of this scheme as yet, but would there be any differentiation with regard to the emoluments of research workers and purely administrative officers in this Colonial scheme?—That point has I believe been considered, and on the whole the tendency is to make the research posts worth more; but at the same time it is recognised that it would be unwise to put the research man and the practical man in very different positions; it would antagonise the practical man who is doing useful work and may be a man of equally good intellectual gifts but of a different kind; in fact he may have the rather more rare gift, a lot of common sense.

57,700. Could a well prepared student who was a studious and earnest man take a natural science Tripos in one year?—(*Professor Wood*): No, the University does not allow you to take it in less than two years; you may not take it before the end of your second year. I suppose if you were an affiliated student you could; if you came from a University which was affiliated and you had done a recognised course there I think you might, if you availed yourself of the privileges of affiliation. (*Mr. Engledow*): Yes, that would be an exceptional case.

57,701. With the majority of these students, affiliation to Cambridge means having obtained an Honours degree elsewhere?—That is so. (*Professor Wood*): Yes, a University that is affiliated has made the necessary arrangements with Cambridge to entitle its students to the privileges of affiliation.

57,702. From the point of view of the University of Cambridge it means B.A.?—(*Mr. Engledow*): It usually means a first class degree, though there are one or two exceptions to that rule.

57,703. With regard to the question of agricultural economics, you do not give any training in economics, you link it on to the economics course?—No, quite a number of our men take economics as a subject for the diploma in agricultural science.

57,704. Where do they go for lectures?—They go to some of the Tripos lectures in Economics, but they get their agricultural economics training from Mr. Venn, who is University Lecturer in Agricultural History and Economics.

57,705. I am entirely ignorant on this matter, but I suppose that the economics course deals with costs and things of that sort?—(*Professor Wood*): I will give you a syllabus. (*Mr. Engledow*): You can obtain a good impression from Mr. Venn's book which he wrote largely for the sake of his own students, feeling there was no suitable book; it covers marketing, land tenure, agricultural legislation, labour and so on. Actually Mr. Venn's lectures are officially recognised by the Board of Economics of the University as providing part of the instruction for candidates taking Part II of the Economics Tripos. Moreover, there is a course on "National Aspects of Agriculture" by Professors Wood and Biffen and two courses by Professor Wood and Mr. Venn for the ordinary degree. These are open to the University at large.

57,706. That is the sort of thing they are taught?—Yes.

57,707. Who gives these lectures?—Professor Biffen and Professor Wood.

57,708. *The Chairman*: Where are the lectures on agricultural book-keeping given?—That comes into the third year of the B.A. course.

57,709. *Dr. Hyder*: I see that there is a regulation with regard to the forestry candidates that they must produce evidence of having pursued diligent studies in a forest at home or abroad, under the supervision of somebody associated with forestry in a University?—A party is made up here by the Reader in Forestry who takes them for six weeks, usually in Germany.

57,710. With reference to your answer to a question put by Sir Henry Lawrence, would you or would you not be in favour of instituting a scheme of scholarships for students who might be recruited for the Indian Agricultural Service?—(*Professor Wood*): I am rather doubtful as to the need for scholarships. I think an advance knowledge of needs is more important than scholarships. If the Universities were informed a year before vacancies occurred what line the vacancies would be in, I think the men would be forthcoming all right.

57,711. There are no corresponding scholarships for the Indian Civil Service?—Quite.

Sir Thomas Middleton: I thought Dr. Hyder's question referred to a scheme for scholarships in connection with Indian training: not a scheme for providing British students for India.

57,712. *Dr. Hyder*: You can take it both ways?—(*Professor Wood*): I am handing you the schedule for the ordinary degree examination in agricultural history and economics. The advanced course would be on the same lines only more advanced. It gives you an idea of the line on which Mr. Venn lectures.

57,713. *Mr. Noyce*: I am especially interested in the statement, Mr. Engledow, of your view that specialisation in one crop is to be avoided if possible. The tendency in India nowadays is to appoint crop specialists to work on cotton, rice, the millets, and so on. You are not altogether in favour of that?—(*Mr. Engledow.*) No, I am not.

57,714. It is a very important point to the Indian Agricultural Department?—Yes; I ought to make that quite clear. My personal feeling is that if I spent all my time on wheat I should get rather tired of wheat. Moreover, it has only the habit of growth of wheat and of nothing else. If one turns to peas or beans or mangolds, the whole habit of growth and physiology are entirely different, and one's outlook is broadened and one's thought is stimulated by having a different crop. That is what is at the back of my mind.

Professor T. B. Wood and Mr. F. L. Engledow.

57,715. It keeps a man fresher, you think?—Yes. At the same time you must remember that in studying any crop of serious importance one's full time can readily be occupied; the two crops may come to harvest at the same time, the worker wants to be in two places at the same time, and it is rather distracting. One should always keep that in mind in considering any suggestion that a breeder should handle more than one crop; but at the same time, I firmly believe in the value of having a subsidiary crop.

57,716. Would you think that 10 millets would provide a sufficient variety of work, or are they too close together to furnish exactly what you have in mind?—This again is a purely personal point of view, but if I had to do work on the millets, I should rather like to do a little on a subsidiary crop, say groundnuts, the habits of which are entirely different; because one must remember that trying to produce an improved variety is not a straightforward task; one has to go aside into many subsidiary considerations. That takes one into questions of fundamental science, and it is in connection with those that it is so stimulating to have a live interest in a subsidiary crop; but it should be a subsidiary crop from the point of view of its demands on time.

57,717. I think you probably know, Professor Wood, that it is, to say the least, extremely probable that India will draw less in the future for manning its Agricultural Department on this country than it has in the past; the tendency will be to send selected Indians over here for training. Could you give us any idea as to how much room you would have for them? What your limits are in that direction?—(*Professor Wood.*) We are terribly full at the present time, and of course the Colleges are very full too. As Mr. Engledow explained, the first stumbling block to any great increase in numbers is to get them into Colleges. If they get into a College we are somehow or other bound to do the best we can for them, because you see we are a department of the University; anybody who is admitted by a College is a member of the University, and if he turns up here we have to find room for him somehow.

57,718. Do the Colleges prefer the ordinary undergraduate to the man who is coming up for a more advanced training, do you think?—I think the College would stretch a point in favour of the advanced man if they could. (*Mr. Engledow.*) Subject to his being really good. There are lots of disadvantages attending the short period advanced man; he comes for a year, and all the trouble has to be taken as though he were coming for three years; but the Colleges open their doors to advanced students provided the standard of the applicant is a high one; they are very insistent on that. (*Professor Wood.*) I think the most important thing is to make Indians who think of coming over to British Universities fully understand they have got to tackle the question of entry before they start from India, and as long before as possible. They should get in touch with the Indian residents in Oxford or Cambridge or wherever it may be, and, asking through the Adviser, get help in finding Colleges. If they are good enough there should be no further trouble. We might easily get crowded, but we should have to meet the situation. (*Mr. Engledow.*) The question of numbers is very important. India is a large place, and if it set to work it could swamp us.

57,719. For some time to come, I take it, the men you would get would be men who would be selected by the heads of the Agricultural Department, as these two from Madras have been?—Yes.

57,720. So that from that point of view you would be fairly certain of getting the required standard?—Yes.

57,721. How do you hear of appointments vacant in India? What is your liaison in that respect? Does the notice come to the Appointments Board? —(*Professor Wood.*) Yes, I think the Appointments Board. That is how it should come, anyway. Sometimes we hear from our own people out there; some old pupil or somebody like that writes and says: "I shall be

having a vacancy in my part of the world in due course; will you look out for somebody?" We hear sometimes like that beforehand; but officially it should come through the Appointments Board. (*Mr. Engledow.*) It usually comes from India at the last moment and in great urgency, just as it does from every part of the Empire. (*Professor Wood.*) I do not think one can insist too much on that. That is the thing which in my case makes recruiting more difficult than anything else. If one could only know a year beforehand, so as to divert the men into the right direction, it would be a great advantage. If you tell a man that chemistry is his best line, and then they ask for entomologists and the man is stranded without a job, it puts off men in future years.

57,722. You might be able to get better men if you had longer notice?—Yes, if we had notice long enough in advance to enable us to divert the proper man in the right direction.

57,723. I notice you say you think the High Commissioner's office has not sufficiently close liaison with the University. Does not the Adviser of Indian students keep the two in touch?—I can show you a letter concerning a man whose parents or guardians wish him to come to Cambridge which shows that the method of admission to Cambridge is not understood and the functions of the Adviser are unknown.

57,724. *Dr. Hyder*: The method is perfectly well understood, but they find that the door of entry can be more easily opened by coming to you direct?—(*Professor Wood.*) Yes, I think they think we can exert pressure which the official representative cannot do, and I think that is perhaps one's own fault, because occasionally one has persuaded one's College to take in men who found difficulty in gaining admission. (*Mr. Engledow.*) The form in which the letter is written displays the most ingenuous ignorance.

57,725. *Mr. Noyce*: Is that letter from the High Commissioner's Office?—Yes. It necessitates my writing the sort of letter I have written a great many times saying the School of Agriculture has no power to obtain admission to a College. It is one of those little routine difficulties which it would be useful to get rid of.

57,726. As an old Cambridge man I should like to ask you what is the difference between the standard of the M.Sc. and the Ph.D.?—That is a matter of degree. If a man would like to go for the Ph.D. and is told he is not up to standard, he goes in for the intermediate, the M.Sc. degree, which he can subsequently convert into a Ph.D.

57,727. It is swallowed up in the Ph.D.?—Yes.

57,728. *Mr. Kamat*: You spoke about the Colonial Services; is there any such system as that of short term appointments in connection with those Services?—(*Mr. Engledow.*) There are normally no temporary appointments which it is understood will terminate at the end of five years in the agricultural research services. I think it is right to say that; no case has ever come to my knowledge, nor from the system do I think it is possible; the whole aim is to obtain permanency.

57,729. On page 677 of your memorandum you state that men who have had some years of work overseas and come here, say, for a year are provided with specific facilities. Will you explain what those specific facilities are?—Let us take the case of plant breeders, as we have had most of those. We usually find that men of that kind from any part of the Empire, for example who have had service in West Africa, feel themselves in need of more knowledge in such matters as yield trials. Yield trials constantly have to be carried out, and methods have developed very rapidly in the past ten years. That is a typical subject. We take the opportunity here of allowing such a man to take part in dealing with the statistical data from yield trials. Then, again, it is possible that a man may like to do some purely genetic work; he has been a plant breeder, he has had to give way to very practical considerations, and he feels he would like to strengthen his hold on the

theoretical side. Then we can arrange for him to do some actual genetic work; it may be microscopic work or dealing with actual hybrids. We offer arrangements for that. Statistics is a subject which is troubling all biologists nowadays; it is not a thing to which most men take naturally, and a special course in statistics for advanced students has been arranged here; it is being given by the University Lecturer in Statistics (Mr. G. Udny Yule), and it is specially for agricultural students.

57,730. You spoke of the difficulty you experience of information being furnished in advance to you as to vacancies and Indian requirements. Suppose the Government of India or the local Governments collectively arranged a system of scholarships for Indian agricultural students here and gave you long notice of intending scholars, is there any guarantee that the Colleges would take all the students for whom scholarships may be provided by the Government of India?—It is beyond our power to answer that; the Colleges are autonomous bodies. This School is a part of the University which has no control over Colleges at all. If a College admits a student, he becomes a member of the University, and we are compelled to let him attend, at any rate, our formal lectures; that is the extent to which we are concerned. (*Professor Wood*): But I imagine that if a scholarship scheme was started, the India Office, acting through the Director of Indian students here, would be able to come to an agreement with the Colleges to reserve places for scholars; I should not think that would be an extraordinarily difficult thing to arrange. (*Mr. Engledow*): No, I see no reason why it should not, but that would not be our work. (*Professor Wood*): It would be the work of the India Office, acting through the Adviser to Indian students.

57,731. I am not asking whether you could yourself arrange it. The point is that if there is any system of scholarships and an endowment fund for India, there must be a sort of assurance that the India Office could come to arrangements with the Colleges here for a reasonable number of scholars to be admitted every year?—We could give no assurance, but I do not think it would be difficult to arrange.

57,732. You think an arrangement is reasonably possible?—(*Mr. Engledow*): There I am not competent to speak; I am not a College officer and am not concerned with admission to Colleges. I do not know the problems as the teachers and masters of Colleges do, and therefore really any answer I could give would carry no weight. (*Professor Wood*): One could not give an assurance as to that.

57,733. *Professor Gangulee*: What assistance is obtained from that department of the office of the High Commissioner of India which looks after students?—(*Mr. Engledow*): In some cases that department has no cognisance of these applicants. A man may write direct from his own college or school in India. In other cases, as I have just suggested, it has appeared to me that in the High Commissioner's office the circumstances of admission to Cambridge are not understood, and an alternative suggestion to that has been made which seems to me to be a very feasible one.

57,734. Are you in touch with the High Commissioner's office?—Only in so far as replying to his letters; we have no formal connection with him.

57,735. *The Chairman*: What do you say about the association of training and research when one and the same man is asked to do both?—(*Professor Wood*): My experience is that it is an extremely useful thing for a teacher to do a certain amount of research because it keeps him interested in the subject, and I think it is extremely useful to a research worker that he should have to do a little teaching.

57,736. Not too much?—Not too much.

57,737. And the right sort of teaching?—Yes.

57,738. Nothing elementary?—I do not know; I do not see why not elementary. I do not think he wants to do a vast amount of routine teaching so as to fill up all his time, but I think a man who is doing research gets help in more than one way by doing a little teaching.

57,739. Can you give the Commission any idea of the amount of teaching which you think a man engaged whole-time on research should do?—It is extremely difficult to fix the time, except by what one can manage oneself. I manage to lecture three times a week all the year round with considerable comfort and without interfering with my research work; I should be extremely sorry to give it up.

57,740. Does that mean three hours lecturing apart from the preparation?—Yes; it means running a continuous course right throughout the year. Lecturing is exhausting to some people, and it is not to other people. It is very difficult to fix a time limit, but I should be very sorry indeed not to do that much, because, first of all, one sees all the students, and, secondly, one has a chance of stimulating some of them to try to be interested in one's own subject.

57,741. *Sir Henry Lawrence*: Professor Wood, could you tell us something of the cross-breeding experiments in sheep in the Falkland Islands and the effect of nutrition on their success?—(*Professor Wood*): Yes, I will so far as I know. The story is something like this: Dr. Orr, of Aberdeen, and ourselves at Cambridge have been collaborating for the last three or four years on the question of the effect of mineral deficiencies in various pastures on the livestock that feed upon them. We got on to it originally through Major Walter Elliott of the Scottish Office, whose people have been sheep breeders for many generations now, and who is steeped in the literature of that subject. He told us of several instances where sheep farmers in Scotland find it necessary to move their sheep periodically. I am sure Lord Linlithgow knows about it. It is found that a farm will not support sheep for more than so many months without their going wrong; at the end of that time, if you do not move them on to a different pasture, their health suffers. That was the first thing we had to consider. We formed ourselves into a committee of Dr. Orr, Major Walter Elliott and myself, and we put people on to sample the grasses of these, what you might call, complementary pastures, and we made analyses. We found no difference in the protein, carbo-hydrate or anything of that kind, but we found very big deficiencies in things like lime, the phosphates and chlorine. In the case of those pastures where the sheep have to be moved from one pasture to another to preserve health we found that if one pasture was deficient in phosphorus, the other was not; they are complementary. It was at that stage that an enquiry came from the Falkland Islands with regard to the failure of imported sheep to do any good there at all; they said that their little sheep which had become acclimatised after many years, although they were miserable little creatures, could live there, while imported animals or the progeny of imported animals went wrong, died off and got all sorts of diseases. They asked if we could throw any light on it. We got samples of the herbage from there, and we found that the Falkland Islands herbage was very, very deficient in the same sort of things that we found deficient in some of the hill pastures of Scotland and Wales. The idea that we have is that these small sheep that have existed there for a long time have a very low rate of growth, perhaps a little over half a pound a week, whereas a normal English sheep grows at the rate of 2½ lbs. a week, about five times as quick; the minerals in these pastures in the Falkland Islands appear to be sufficient to support a growth rate of half a pound a week, but entirely insufficient to support a growth rate of 2 or 2½ lbs. a week, such as would be the normal growth rate of the kind of sheep they have tried to import there. It seems to me that that is a quite general state of things: if you

try to introduce these quick-growing modern breeds to any new country you should make quite sure before you start that the mineral constituents of the pasture, or whatever you have got in the country for feeding, are sufficient to support the growth rate of the kind of animals you propose to introduce.

57,742. *The Chairman*: Do you suggest it would be a business proposition to try and supply the deficiency artificially?—We are trying that in Scotland at the present time. We have had a lot of disappointments because the shepherds and people of that kind have not used the stuff with which we supply them. In one place, for instance, the report came through that the stuff was no good; Dr. Orr's assistant, Mr. Creighton, went down there to enquire and was told it was no good. Dr. Orr then went down himself; on arrival at the shepherd's place the only person about was a small child. Dr. Orr rather suspected that this stuff had not been used. He therefore said to the small child: "I sent some bags with white labels on them here some time ago; where are they?" The child replied: "They are up in the loft"; and there in the loft were the bags which had never been opened. That sort of thing has happened a great many times and it has ruined a great many of our experiments. We have had cases in which we have sent men down to see that the animals had the stuff, and it has been entirely successful. In the Isle of Arran one of Dr. Orr's junior men was living; he took charge and saw that the animals actually had the mineral mixture that was designed to replace or make good or supplement the deficiencies of the herbage on this particular sheep run, and there it was entirely successful: I mean there have been practically no deaths and the animals have since grown of the order of twice as fast as the growth rate they have been accustomed to in the past.

57,743. Do they show avidity for the artificially supplied deficiency ration?—It has been found difficult to get the animals to eat it at first. The same sort of work has been done by Sir Arnold Theiler in South Africa with regard to the phosphate deficiency; they had great trouble in getting their animals to start eating bone meal, but when once they had tasted it there was no trouble.

57,744. *Sir Henry Lawrence*: It is artificial food that you supply?—There are two ways of doing it. We want to try it by the direct method to see whether, if you do give them the particular lime or phosphate or whatever it is that is deficient in the herbage, it effects a cure or prevents the onset of the undesirable symptoms. In the instances in which we are quite sure the animals have actually eaten the stuff it has been successful. Another, and it seems a much more simple way of doing it, is to manure with those things.

57,745. Has that been tried?—It has not been tried because before trying manuring we want to be quite certain that if you supply the deficient constituents it is going to prevent the symptoms. I think we are pretty sure of that now.

57,746. Is the deficiency of one particular constituent more serious than that of another?—I do not think so, but they produce rather different results I think. A very frequent deficiency is calcium, a fairly frequent deficiency is phosphorus; occasionally iron is deficient, and occasionally chloride of sodium.

57,747. *Sir Thomas Middleton*: What you have been saying as to the relation between the rate of growth and mineral deficiency applies equally to energy deficiency, does it not?—We have analysed now I think three hundred samples of pasture grass and the variation in the energy content is not more than five per cent. at the most; but the variation in the mineral content is two or three hundred per cent.: one may have three or four times as much as the other.

57,748. But if you are having a more rapid rate of growth, you must have a more rapid supply of energy?—Yes, that is undoubted.

57,749. That is the prime difficulty in India: it is energy that they cannot get?—Quite.

57,750. It is not mineral deficiency: starvation is the problem?—Then of course the mineral question does not arise.

57,751. There are however a good many districts in which the mineral question does arise?—It is astonishing to notice the number of places where the mineral deficiency does arise. With regard to ordinary pig feeding, when a pig gets to factory size in six months you have practically got to give a mineral supplement unless you are prepared to delay the growth rate.

57,752. *Sir Henry Lawrence*: It is a practically universal law that in these cases of improved breeding there is a greater rate of growth?—In all improved breeds, if you get high production either in growth rate or in milk, you nearly always have to look after the mineral content of your ration. If you are going to have a cow giving seven or eight gallons of milk a day, a bullock that puts on three pounds live weight a day, or a sheep that puts on three pounds a week, whatever it may be, you have always got to make sure that your mineral supply is not checking the growth rate.

57,753. *Sir Thomas Middleton*: A cow at Hissar Farm giving about five pounds of milk a day has got to walk eleven miles a day in order to support itself?—Yes.

57,754. How many miles a day would it have to walk if it gave two gallons a day?—I do not know; I have not tried to find out that.

57,755. You will find that it would have to be on the trot all day long?—Yes. No amount of mineral adjustment will make good the energy deficiency.

57,756. The point is that in India some breeders aim at the dual purpose animal; they want to get two or three gallons of milk where they are at present getting half a gallon; they do not consider that the animal's power of securing the necessary supply of energy is limited?—Quite; but is there no food except pasture grass for them?

They have to live on pasture grass, and in the Hissar case I mentioned, cows, we were told, have to walk eleven miles a day on a pasture which for India is a good pasture to keep up their condition and provide some five pounds of milk a day.

(The witnesses withdrew.)

Sir ROWLAND BIFFEN, Kt., M.A., F.R.S., Professor, Agricultural Botany, Cambridge University.

MEMORANDUM ON THE PLANT BREEDING INSTITUTE, CAMBRIDGE UNIVERSITY, FOR THE ROYAL COMMISSION ON AGRICULTURE.

The function of the Institute is to investigate the possibilities of improving the types of plants grown as farm crops in this country and where practicable to produce improved types for general distribution. It is maintained by annual grants from the Development Commission. Its average annual expenditure is about £4,000.

The Staff consists of a Director, two first grade assistants, one second grade assistant and one or two third grade assistants. The third grade

posts, both of which are temporarily vacant, are probationary, the second and first grade posts are permanent. The salaries attached to the posts are:—

Third grade £300-£350 with a yearly increment of £20.

Second grade £400-£600 with a yearly increment of £25.

First grade £600-£800 with a yearly increment of £25.

All of the graded posts are pensionable. Each member of the Staff contributes 5 per cent. of his salary towards the pension fund to which the Institute adds a further 10 per cent.

The staff is recruited in the main from holders of Development Grant Scholarships.

In addition there is a non graded staff consisting of a statistician (part-time) and laboratory and field assistants.

The research work is carried out partly in the School of Agriculture where a number of rooms have been especially equipped for the purpose and partly on the experimental farm where simple accommodation is provided for sorting the various crops, threshing, seed cleaning, etc.

Each of the senior members of the staff specialises on one of the more important crops—wheat, barley, oats. With these the problems to be solved have been clearly defined as the results of previous work, the genetics of each crop have been investigated in some detail and the work of improvement is in full progress. They also take a share in the investigations on the possibility of improving other crops such as potatoes, sugar beet, swedes, beans, peas and vetches. At present the work with these crops consists mainly of genetic studies but where knowledge of the subject justifies it, or as with the potato crop work is specially urgent, efforts are being made to produce results of economic value. An essential part of all genetical studies pursued with the object of breeding more valuable forms of the staple crops is to collect as many of those in cultivation as possible. In the case of cereals cultivated over a wide geographical range the numbers grown are very large. Though, so far, the extensive collections made have not resulted in the discovery of a single form suitable for growing as a crop under English conditions, the work has proved profitable, for a few varieties of especial value to the plant breeder—owing to excellence in some special feature such as disease resistance, grain quality, etc.—have been found. The work in progress with the wheat crop illustrates this clearly for grain quality is being provided by the Canadian Red Fife, rust resistance by an American wheat, mildew resistance by a wheat from Persia and a Chinese wheat is being used as a source of early maturity. Moreover some of the forms collected have proved useful to colleagues in other parts of the world.

Disease Resistance.—At an early stage of the investigations designed to test the possibility of improving the forms of wheat in cultivation in this country evidence was found that resistance and susceptibility to yellow rust were separately inheritable factors and that the way was open to definitely breed rust-resistant forms. Since then, whenever an opportunity has been available, further studies on the inheritance of disease resistance have been made with results that show that the same state of affairs holds with regard to the inheritance of resistance and susceptibility to other plant diseases. The subject is developing rapidly and the prospects of controlling outbreaks of disease by growing non-susceptible crops are unusually hopeful. Thus the hybrid descendants of the Chinese wheat are designed to control the brown rust of the Argentine. Crosses are now being made with others to produce early-maturing rust resistant types for growing in Kenya Colony and yet others have been sent out to India for trial.

Testing New Varieties.—An essential and in some ways especially difficult part of the Institute's work is to test out new varieties before distributing them for general cultivation. In order to have an ample range for selecting from, large numbers of new forms are raised. It is not unusual, for instance, to have to decide which is the best of some three hundred wheats or barleys to work up stocks of. To grow all of these on even in 1/10 acre plots is impracticable and the first selections have to be made on plots a yard or so square in which the plants are uniformly spaced and growth conditions are made as similar as is practicable. Observations made on these small plots throughout the growing period form the basis on which the first selections are made. Actual measurements are more or less impracticable and moreover, on so small a scale, they would be unreliable. The first selections then are determined largely by the judgment of the plant breeders and personality inevitably plays a considerable part in making them. Some five to ten forms may be considered to be worth more accurate testing. The chess board method is used to determine their relative yielding capacity, some well-known standard variety being used as a control.

Two such trials give fairly reliable data as to the cropping capacity of the series under test. Concurrently in the cases of wheat and barley, small stocks are worked up in order to determine the quality of the grain. This is becoming of increasing importance, especially in wheat, for much of the English crop is of indifferent quality from the bakers' point of view and the demand for better grades is becoming marked. A full scale milling and baking trial requires more grain than can be grown on before a final conclusion has been reached as to the suitability of a variety for general cultivation. Consequently, methods of making small scale tests have had to be devised and, as in the case of yield trials, sufficiently accurate results for the purpose in view can now be obtained.

The investigation of questions concerning quality have proved difficult owing to the lack of detailed knowledge on the subject. Much of it is purely empirical and neither bakers nor maltsters are at all unanimous amongst themselves as to what their requirements are.

As a consequence, the work on each of the crops becomes a specialist's job and the man in charge of it has to pick up, as best he can, information which will aid him in his work of building up new types which will meet with the approval of both producer and consumer.

In the early days, the distribution of new forms was undertaken by the Institute. This entailed large scale growing on the experimental farm and growing under contract with neighbouring farmers. It was found difficult to supervise the cultivation and harvesting satisfactorily and to provide for the labour of cleaning and despatching seed, which came at a time when both the scientific and field staff were particularly busy, was an almost impossible task.

Growing on and distribution is now carried out by the National Institute of Agricultural Botany. This makes large scale trials of the new forms for two or three seasons and arranges, where necessary, for commercial tests as well. The seed crops are grown on a large scale and distributed *via* the seed trade at an agreed price to farmers. The whole of the work is financed by the National Institute and any profit resulting from the operation is shared between the two Institutes.

Oral Evidence.

57,757. *The Chairman*: Sir Rowland Biffen, will you please describe exactly your appointment here?—I am Director of the Plant Breeding Institute and Professor of Agricultural Botany.

Sir Rowland Biffen.

57,758. Are you familiar with conditions in India?—Very little; it is simply indirect knowledge which one has picked up from one's students who have been working there; I have no personal experience.

57,759. I think your own time is devoted mainly to plant breeding?—That is so.

57,760. A previous witness has just told the Commission that in his view specialisation to the extent of one crop only, without any interest in any other crop, may narrow the research worker's outlook and to some extent sterilise his mind. Do you agree with that?—To a certain extent, yes. On the other hand, so many of these plant breeding problems are of such extent that it is almost necessary for a man to specialise. With a single crop like wheat, for instance, there is quite enough to be done to keep a man very busy for the whole of his lifetime.

57,761. Perhaps refreshment comes with a very small amount of time devoted to other crops. Is it worth while, simply for the sake of relaxation and a little change, to do a small amount of work on other crops?—We make a practice in the Institute of a man specialising on one crop, giving up the greater part of his time to it, and working on a crop of some minor importance too. We have, for instance, three senior members of the staff, and they are specialising on our three most important crops: wheat, barley and oats. Then they take up more or less minor investigations on peas, vetches, beans and so on.

57,762. Do you see much of the Indian students who come here?—We have had a number of research students, some of whom have been working under my direction.

57,763. What about their calibre and equipment when they come here?—Very varied; some men come over with a passably good training and some are certainly inadequately equipped.

57,764. Do you share with the previous witness the view that it is in pure science that Indian students as a rule fail?—It is difficult to say; I have had two men who have done very satisfactory work with me, but the rest, I think, have been more or less under average.

57,765. It has been suggested that it is in the practical work and laboratory technique that, in the main, the short-comings lie: there has been enough book work, but there has not been enough time given to reflection and digestion, not enough experience at the bench and in laboratory technique; is that a fair statement of the position?—Yes, I should say that is generally true; they are men who pick up a very thorough book knowledge of their subjects and are rather apt to fail on the practical side.

57,766. Have you had Indians engaged on research work?—Yes, several.

57,767. How have they done?—The last one who was working with me was doing quite satisfactory work, really good work; but I have not been too pleased with the work which has been carried out by others.

57,768. Was this man trained in India?—Yes, he is an older man than the average line of them; he has occupied a research post in, if I remember aright, Madras for some years now. He came over here to investigate the genetics of earth nuts; the subject, of course, was one of his own choice, but naturally it is a fairly difficult subject to investigate here where earth nuts will not grow; he was undoubtedly handicapped from the start.

57,769. Do you think that, as a general rule, Indians come over here for post-graduate training at the most appropriate moment, or do they come over too early in their careers?—Too early in most cases, I should say.

57,770. It would be better that they should remain in India for another year or two?—I think it would be a fair statement to make that our general experience is that they are inadequately trained in research work when they come here, and it is advisable to put them on to one of our advanced courses, say the diploma course.

57,771. Could you give the Commission any idea of the number of Indian students who have passed through your hands?—Somewhere about a dozen at various times.

57,772. Not enough to provide any firm indications, perhaps, of the general run of qualification and equipment?—No, it would not be fair to generalise.

57,773. Are you in touch with the Agricultural Departments and workers in India?—With the men who have gone out from this department, yes, but not otherwise.

57,774. Has much good on the technical side come from that association? Have you been able to help them, or have they contributed anything to your knowledge?—Our problems are so different; practically the only crop we have in common is wheat; there, I think I have been able to help the Howards perhaps, and they in turn have been useful to us.

57,775. Have you been able to assist them in any particular department of the crop?—By exchange of material, yes; and we have been able to do a certain amount of hybridising work for them on this side.

57,776. On their own seed?—The problem is rather a curious one. In India, losses from yellow rust are very serious; it so happens that that is the common plague in our own wheat crop, and we have been able to work jointly on the problem. Further than that, Howard of Pusa came to the conclusion that it would be advantageous if crosses could be raised between some of our English resistant types and wheats native to India. It was found that those crosses could not be made there because the English forms mature so slowly that they could not be brought into flower at the same time as the Indian wheats. We could, of course, grow the English wheats here easily, and by sowing the Indian wheats very late in the season we managed to flower the two together, make the crosses and send the produce out to him for further work.

57,777. How long ago was that?—That would be before the War, somewhere about 1912.

57,778. Have those varieties been successful?—I believe they have bred some quite useful crosses from them.

57,779. Do you know whether they have a high resistance to rust?—Yes, I think so. Again, last year, one of the Indian students (a man named Sawhni) made a somewhat similar series of crosses between some of our heavy yielding rust resistant types and some of the Indian wheats. Those are now being grown out there.

57,780. How long does pollen extracted from the flower remain active?—In the case of wheat I know it will retain its vitality about three weeks; whether it will last longer than that I cannot say.

57,781. That helps you to bridge over difficulties of bringing varieties to flower at the same moment?—Yes, it does; it helps considerably.

57,782. To what extent is the general planning of your work dependent upon practical experience of farms run for commercial purposes; in other words, on the views of the ordinary farmer? Do you regard it as important that that aspect of the work should be kept in view?—I think it is essential.

57,783. Is there some danger that work being carried on at a research centre where commercial considerations do not arise may get out of touch with the day-to-day needs of the farmer?—It ought not to. We find the farmers are, as a rule, pretty severe critics of the material we produce; they come round our experimental plots and they almost invariably pick out the types which they prefer.

57,784. Do you get the publications issued by the various Agricultural Departments in India?—I think all of those come into the laboratory.

57,785. Have you formed any view of the work at present being done at Pusa, for instance?—It is difficult for us on this side to gauge its actual value; I do not think we know the conditions well enough.

Sir Rowland Biffen.

57,786. What do you say about the association of teaching and research?—I am afraid it is a necessary association, but——

57,787. But it is a nuisance?—It is a nuisance. The teaching takes up a great deal of the time one would rather be giving to research; on the other hand, teaching is very good for a research worker.

57,788. *Professor Gangulee*: On the question of plant breeding, do you think uniform methods of testing a new variety in different localities is desirable?—Testing the finished product?

57,789. Yes; when you get certain new varieties, is it necessary before you pass them on to the farmers to try them out in different centres?—It is certainly advisable if you can do it; but if you do so it will probably hang up the distribution of the crop for perhaps three or four seasons while the tests are being made.

57,790. How do you maintain the link between the plant breeders and actual farmers?—As a matter of fact, we do make tests like that.

57,791. In different parts of the country under different soil conditions?—Yes; I should say they are made for us now by the National Institute of Agricultural Botany. Those tests are probably far more essential in India where you have a much wider range of conditions than they are in this country.

57,792. How do you carry out that scheme of co-operative and co-ordinated trials in different localities?—From the National Institute of Agricultural Botany.

57,793. So that your department has nothing to do with those trials?—No; I am thankful to say I just hand my material over to that organisation and ask them to get on with the job; they have about half a dozen stations scattered over the country and they carry out those tests.

57,794. Is it done on a uniform basis?—Yes, absolutely.

57,795. Are the results presented to you or to the Institute?—They go to the Institute first and then come on to me.

57,796. Is there any independent concern working in association with the Institute?—No, not working in association with it. There are a number working in the country, but they do not work with us.

57,797. Is there any private plant breeder working in conjunction with your plant breeding institute?—There is one we are in very close touch with, but he is not associated with the station in any way; he is a man who has specialised on the barley crop.

57,798. Could you explain to the Commission what are the agencies you have through which new varieties actually pass on their way to the farmer?—Yes, the stocks of seed which we raise are handed over to the National Institute of Agricultural Botany. After testing them for some two or three years, testing them both from the farming and from the commercial point of view, they raise large stocks of seed, anything up to 20,000 bushels. Those stocks are then distributed to the seed trade, who in turn hand them on to the farmer. It is a very indirect way of getting seed on to the market.

57,799. *The Chairman*: Does the farmer get any guarantee of the purity of the seed?—The purity and the germinating capacity are guaranteed, yes.

57,800. By the seedsman?—By the Institute.

57,801. Not by the seedsman?—The Institute hands the seed on to the seed trade in sealed sacks and the packages are sold in an unbroken form.

57,802. And do the trade themselves multiply it?—After the first year, yes.

57,803. Does the Institute continue to sell bagged selections through the seedsmen after the first year?—Not after the first year, no.

57,804. *Professor Gangulee*: But the tradesmen are bound by your Seed Act?—Yes, they simply take the guarantee of the Institute that the seed

is 99.5 per cent. pure or whatever it may be, and that the germination is, say, 98 per cent.

57,805. When they sell to the farmers they themselves do not give any guarantee?—They hand that guarantee on.

57,806. How is this National Institute of Agricultural Botany financed?—Partly by the Development Commission, and it has funds of its own which come from capital which was collected partly from the seed trade and partly from the millers and kindred organisations.

57,807. What is the relation of this Institute with, say, the testing station in Scotland or in Northern Ireland?—We have no connection with the Scotch station or the Irish station, except that the Directors of course meet casually.

57,808. Is any "Yeoman II" grown in Scotland at all?—Yes, there is a certain amount in the Lowlands and I have seen it further north.

57,809. Have you obtained any financial assistance from the Development Commission?—Yes, the Plant Breeding Institute is financed by the Development Commission.

57,810. Entirely?—Entirely, yes.

57,811. *Mr. Calvert*: Can you suggest any means whereby the research worker can be led a little more narrowly along the road of direct economic profit? The tendency is for him to get on to some intellectually interesting problem and rather forget the cash point of view to the actual farmer?—Is that so?

57,812. The newspapers are at present talking about agriculture in England being on its last leg and the Development Commission for many years has been pouring out millions of pounds on research work?—Yes; I should have thought from the plant breeding point of view the workers were concentrating on perfectly definite economic problems rather to the exclusion of pure research. I know, in our own case, there are dozens of obvious scientific problems which are simply pushed on one side so that the staff can be kept on economic work.

37,813. *The Chairman*: Do you think it possible that were it not for science the last leg might have collapsed long ago?—I do not know; the work is making a difference, but one cannot say to what extent.

57,814. *Mr. Calvert*: You do not think there is any tendency for the research worker to lose himself in the problems of more intellectual interest, to the neglect of the problems of more direct economic interests?—I think not. I think you will find that my people are more or less *au fait* with all the technical details of malting, flour milling and so on.

57,815. *Mr. Kamat*: I understand from you that the seed trade here is the link in the distribution of seed. Will you explain the extent and the ramifications of the seed trade in this country?—The ramifications as far as we are concerned with them as distributors of new wheat?

57,816. Yes?—Their function is simply to hand on the stocks which have been grown by the National Institute of Agricultural Botany to their own special customers, incidentally making a profit out of the transaction.

57,817. To reach the villages in the different parts of the country have they branches of organisations all over the country?—Yes, the seed trade can distribute in all directions.

57,818. They are not concentrated merely in certain localities?—No.

57,819. They are well distributed?—Yes, they can reach practically every farmer in the country between them.

57,820. The seed trade is based on private enterprise with private capital?—I think absolutely.

57,821. Without any assistance from Government?—No.

57,822. Is there any control exercised by Government over the seed trade to see that there is no adulteration or malpractices on their part in

the distribution?—Through the Seeds Act, yes; everything the seed merchant sells now has to be sold under a guarantee of purity and germinating capacity.

57,823. Do you think the Seed Act, or legislation of that nature, is a necessary accompaniment of the seed trade in the country?—We carried on for a very large number of years without it, and before the Seed Act the trade as a whole was in a very satisfactory condition here; but malpractices were known and since the passing of this Act I think there is no doubt that the standard of quality has improved quite markedly.

57,824. The Act must have come into existence because the malpractices were so serious?—I do not know; I often wonder whether it would have come into existence if it had not been for the War. Our larger seed firms are very satisfactory organisations, but the less said about the smaller ones once upon a time, the better perhaps.

57,825. In India, seed distribution is done more or less by the departments?—Yes.

57,826. But supposing it were left to be done by private enterprise, a Seed Act would be absolutely necessary?—It would be essential, yes.

57,827. *Sir Thomas Middleton*: In reply to Professor Ganguleo you mentioned that you did not, in your plant breeding work, co-operate with trade associations. That is of course strictly correct, but as a matter of fact you are very closely associated with members of certain associations?—Yes; I was thinking of seed trade associations.

57,828. I am also thinking of work that has been done in connection with your work by the Incorporated Association of British and Irish Millers?—Yes; of course, in connection with wheat work we are in the closest possible touch with both millers and bakers, and in connection with barley work with the brewers. We have to be to acquire technical information.

57,829. I only want to bring out the fact that while there is no formal association, you are in fact in the very closest touch with the customers for your new cereals?—Certainly.

57,830. *Dr. Hyder*: Could you give us some advice as to the organisation of our research work in India? My point is: should we organise research according to crops or should we pool the research on the different crops?—If I had to direct the work I should suggest that one worker should concentrate say on cotton, one on millet and so on, and I take it you would almost want separate stations for each crop.

57,831. *The Chairman*: Why separate stations?—Would you be able to grow them all at a single station? I was thinking of such diverse crops as cotton, sugar, millet and so on.

57,832. That is on the question of agricultural environment and not of the convenience of the research work?—From the research workers' point of view have them all on one farm if possible.

(The witness withdrew.)

(The Commission then adjourned till 10 *a.m. on Friday, the* 15*th July.)*

Friday, July 15th, 1927.
CAMBRIDGE.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Professor J O. S. BUXTON, M.A., F.R.C.V.S., Cambridge University.

Replies to the Questionnaire.

15. *Veterinary.* (*a*) In my opinion the Civil Veterinary Department should be independent.

(*d*) Legislation dealing with notifications, segregation, disposal of diseased carcases, and prohibition of movement appears to be highly desirable.

(*e*) Adequate provision should be made for the proper storage of serum at a number of centres.

(*g*) The provision of further facilities for research into animal diseases is very desirable.

(*i*) I strongly recommend the appointment of a Superior Veterinary Officer with the Government of India.

Oral Evidence.

57,833. *The Chairman*: Professor Buxton, will you tell us the exact appointment you hold here?—I am Professor of Comparative Pathology in the University and Director of Animal Pathology.

57,834. Have you experience of Indian conditions?—Not first hand knowledge.

57,835. You say that, in your opinion, the Civil Veterinary Department should be independent; would you care to develop that and to give us some of the reasons for your opinion?—The principal reason at the back of my mind when I made that statement was the fact that in this and other countries it has been found that many difficulties arose when one technical department was under the control of another, or partly under the control of another, technical department: that it did not make for the smooth working of either department. That has been evidenced in America to a far greater extent than I think in any other country, where every endeavour has been made to give as much freedom as possible to their various technical departments.

57,836. Then you go on to say: "Legislation dealing with notifications, segregation, disposal of diseased carcases, and prohibition of movement appears to be highly desirable." Have you the facts of the situation as they present themselves in India before your mind?—I think I have some of the more salient facts; I appreciate many of the difficulties which arise in connection with legislation.

57,837. It is often easy to pass laws but difficult to administer them?—It is extremely difficult I understand, especially under conditions in India, but I must say it appeared to me that possibly one might be able to avoid some of the more controversial points to start with, because it seemed to me to be impossible to have any organisation controlling disease unless you had some legislation.

57,838. No doubt you appreciate the difficulties attaching to the existence of areas in the Indian States contiguous to British India and with no natural barriers?—Yes; but, of course, difficulties like that have been overcome; for example in outbreaks of foot and mouth disease in the United States of America where the boundaries, as you say, between States are not very well defined. I think we all have it fresh in our minds that two years ago they were faced with an exactly similar problem during the outbreak of foot and mouth disease in the United States, and that by exercising a considerable amount of ingenuity they were to a large extent able to overcome that problem.

57,839. But in India you have the added difficulty that there is a different system of government in the Indian States, over which the Government of India has, of course, no detailed control?—That is true, but there is also a slight difference, of course, in the Government of the various States of the United States of America: one State made laws which another State did not make; they were confronted with that difficulty, but in a less degree, I think.

57,840. Were those difficulties overcome by exercising the authority of the Federal or Central Government?—No, the Central Government did little in overcoming the difficulties; they were overcome really by the legislation of the respective States.

57,841. As the result of conference?—Yes.

57,842. Then you say: "Adequate provision should be made for the proper storage of serum at a number of centres." Perhaps you would develop that?—There have been instances, I believe, in which the use of serum, particularly anti-rinderpest serum, has not been extraordinarily successful; one of the principal reasons was the loss of potency of the serum because there were not adequate facilities for its cold storage; another was the length of time taken in transit. I have been told that if adequate facilities for cold storage were provided, the potency of the serum would be very much better maintained.

57,843. How about the value of the serum-alone as compared with that of the serum-simultaneous methods of immunisation?—Undoubtedly if you can get over the risk of the serum-simultaneous method you get a very much better immunity than by the passive immunity given by the serum-alone method. In the serum-alone the passive immunity is extraordinarily transitory, and I do not think it ever pays to use a method of producing passive immunity if you can get an active immunity; but in some cases, particularly in the case of such diseases as rinderpest, there is a certain amount of risk in using the active method; there must be a certain mortality.

57,844. *Mr. Calvert*: Must?—Must. Perhaps I may qualify that word "must." My reason for saying that is that when you produce an active immunity which is of real value you are getting very near to the point where you produce the disease in the animal or the human being.

57,845. *The Chairman*: It has been suggested to the Commission that the length of time of immunity conferred by the serum-simultaneous method in Egypt is more than twice as long in terms of years as the same in India; do you think views of that sort can have been founded on sufficient experiment, or do you think that is likely to be an error?—I should say that that view is not founded on a very lengthy experience; but on the other hand there may be a considerable amount of truth in it: for this reason, that the degree of immunity which is conferred depends to a large extent upon the virulence of the virus which is being used for the purpose, and I understand that the virus which is being sent out for the serum-simultaneous method in Egypt is of greater virulence than the virus which is sent out for the same purpose in India. But that is a difficulty which can easily be overcome.

57,846. *Mr. Noyce*: Where do they get their virus from in Egypt?—From Cairo or near Cairo, I think, where Rabagliatti was doing it.

57,847. *The Chairman*: You mean that the indigenous strain of rinderpest organism is more virulent in Egypt than in India?—So I am told, and I think it is probably the explanation.

57,848. You could work up the virulence of the Indian organism, could you not?—I do not see why not; but it increases the risk.

57,849. Have you any detailed knowledge of the campaigns of immunisation by the simultaneous method that have been carried out in certain of the Crown Colonies?—I have no details of them, no.

57,850. Have you in mind any large scale effort of that sort?—Not along similar lines.

57,851. In your opinion, is the technique of administration under the serum-simultaneous method so difficult as to make it improbable that an unskilled subordinate service would be able adequately to carry through the work?—No, it is only a question of slight training of the people who are going to carry out the work.

57,852. A man need not be a skilled clinician to carry out the work?—No.

57,853. So that there is no reason why a large service should not be trained for a special campaign of that sort?—No, there is no reason at all; we have to do it in this country not on such a large scale but on a fairly large scale, and we have to use ordinary farm labour occasionally; we have not had any serious trouble.

57,854. For the simultaneous work?—Not for rinderpest, of course, but for a simultaneous method which we use for the immunisation of sheep.

57,855. *Sir Henry Lawrence*: What percentage of loss will be anticipated on this system? Apart from any difficulties arising from the administrators of the serum being inefficient, what would be a reasonable moderate percentage of loss?—The mortality is said to be from two to three per cent.; but it is now said to be higher and probably is higher in the case of rinderpest.

57,856. If anybody said five per cent., you would regard that as normal?—I think up to five per cent.; it probably is round about five per cent. But the difficulty is that you get a very much higher mortality percentage in some areas than in others; it may be ten per cent. in one area and one per cent. in another, which rather upsets the ten per cent. area. It does not happen that you get a level percentage over the area; that is never so. It was exactly the same with pleuro-pneumonia.

57,857. *The Chairman*: To what is death due in the majority of cases?—In the majority of cases it is due actually to the virus, but of course in some instances it is due to secondary invaders.

57,858. That is to say, the serum does not provide a sufficient immunity early enough to save the life?—Yes.

57,859. Going on, you say: "The provision of further facilities for research into animal diseases is very desirable." Have you formed any view as to whether that research should be carried on at a centre by the Government of India or in Provinces under provincial administration?—I do not think it is possible for adequate research to be carried out at one centre in a country such as India. Apparently it is not possible in any other country. I should suggest some organisation such as the Bureau of Animal Husbandry as the system one should apply. There might be a central station, but there certainly should be a number of subsidiary research stations. Linking them up is a matter for consideration, but I think that is certainly so.

57,860. How about teaching and its effect upon research and vice versa? Do you recommend the association of teaching and research?—Yes, so long as the men who are engaged in research are not taken off that work too much for teaching.

57,861. Do you think the benefit is mutual?—Yes.

57,862. You go on to recommend the appointment of a superior veterinary officer with the Government of India. What have you in mind as to the functions of that officer?—I take it that in the event of there ever being legislation he would be the officer who would be primarily responsible for suggesting the lines along which legislation in connection with animal diseases should go. I should think there can be little doubt but that a man of that kind is necessary in a wise administration. Then, again, another important question, I think, is that of the promotion of the junior officers; it seems to me that a man must have a fairly intimate knowledge of the officers in order to make wise promotions. Then, again, in dealing with purely veterinary questions, it seems to me that a man of that standing would be a very great advantage.

57,863. Where the subject is provincialised and the personnel directly under the head of the Imperial service is limited to the research staff at the one or two central stations, there would not be much work in the way of controlling appointments and promotion, would there?—I do not know if the promotions are made actually in the Provinces.

57,864. Do you regard research into the problems of genetics as important?—Yes, undoubtedly.

57,865. Is that particular area of research one which might well be undertaken by a central station, or should it be local, do you think?—I think it would be better if it were local, and that was one reason why, a moment ago, I suggested that the organisation might resemble the Bureau of Animal Husbandry, because there the various different types of research are kept more or less together, so that there is a considerable amount of economy effected in general running expenses, and their genetic research would naturally go along side by side with, say, pathological research.

57,866. *Professor Gangulee*: But the Bureau of Animal Husbandry is a centralised organisation, is it not?—There is a central organisation, but then there is the State organisation as well; that is the attraction of the bureau system I think.

57,867. *Sir Henry Lawrence*: You spoke of the control of these technical departments of the United States as having given some difficulty; can you tell us how they overcame that difficulty?—By having independent heads of departments who actually worked together and sat round a table together but had no actual control over the work of each other.

57,868. Was there no common authority over the total number of these technical advisers? Where is the control centred: in the Secretary to the Government, or what?—No, there is a Director of the Bureau and he acts as Chairman of the round table conferences.

57,869. Is not that Director a technical man himself?—No, he is not a technical man himself.

57,870. Purely an administrator?—Purely an administrator.

57,871. *Sir Thomas Middleton*: I think the serum-simultaneous method is applied to a group of diseases; it is not a method that is confined rinderpest?—Not by any means.

57,872. Have you been working on any diseases in which this method is largely employed?—Yes, in a variety of diseases in which a simultaneous method is used.

57,873. What is your general view as to the character of the method from a pathological point of view? Is it a satisfactory method?—No, obviously it is an unsound method. As a matter of fact, in every instance that I am aware of it is an old-fashioned method; it goes back to the time of Pasteur: no alteration has been made. There has been no research carried out, as far as I know, to improve that method. I am thinking at the moment of swine erysipelas, for example.

57,874. The aim of those engaged in veterinary research at the present time is to substitute some other method for the serum simultaneous?—To try to get as firm an immunity by a safe method.

57,875. Could you describe to us any parallel case in which you yourself have worked and indicate the kind of work that is wanted along those lines?—As you know, I am a member of the Foot and Mouth Research Committee. We dare not suggest a serum-simultaneous method in this country; we simply dare not do it; we did not give it any thought at the beginning, but we set to with an idea of finding some modified virus which would give us a firm immunity and which would be safe. I think probably we may succeed.

57,876. Following that lead you would suggest, as an important subject for research in India, parallel research for a safe method of dealing with rinderpest?—I think so, certainly.

57,877. You said you thought we could do nothing to control epidemic disease unless there was some form of legislation. If one is unable to control movement, or to enforce a stand-still order, can one get any considerable value out of legislation in dealing with epidemic disease?—I should have thought that isolation and segregation could have been enforced without a wholesale stand-still order, and that surely must be better than having no isolation and segregation. But I should have thought that segregation would be a most valuable thing.

57,878. *Dr. Hyder*: In the absence of cold storage facilities and under the Indian conditions, what period of time do you think reasonable for serum to retain its efficacy?—That is impossible to say, because the drop in value is a slow and steady process, and one cannot say that serum kept at a certain temperature will lose a certain potency in a given time. You can send out two batches of serum of known potency under exactly similar conditions, and one batch will drop very much more in potency than another, without any apparent reason.

57,879. Would it be a year or two years?—It is impossible to say.

57,880. *Professor Ganguleе*: You refer to the organisation in the United States of America; is not it a fact that the control of legislative measures dealing with diseases of animals such as quarantine is entirely under the Federal Government?—Yes.

57,881. Do you know how they really bring their measures into operation? What is the relation of the Federal Government with the States in respect of such controlling measures?—The Federal legislation allows the States to enforce legislation of their own, and it is supplemented by legislation in the States themselves.

57,882. The fundamental questions relating to animal genetics are dealt with by the Bureau of Animal Husbandry, are they not?—Yes.

57,883. Actual trials in stockbreeding are done by the States; is not that a fact?—That is so.

57,884. Have you formed any idea as to what should be the link between the centralised research station and the other research stations, judging from the experience, for instance, that you have had of American organisations?—I think there should be a central research institution with a director in charge; there should be other research institutions with directors in charge; but it is quite evident that you cannot have a sufficiently large and competent staff at each small centre. In order to get over that difficulty, apparently the best thing to do is to have a fairly complete staff of workers at the central institution, and when necessary draft out the men who are to undertake a particular piece of research: in other words, you send out the necessary team from your central place to assist the local Organisations.

57,885. Therefore in the centralised research station which you visualise, on the question of animal husbandry, you would have three distinct departments: animal nutrition, animal genetics and animal pathology?—Yes.

57,886. What would be the link between all the research stations and actual stockowners?—I do not know whether you could work it in India, but the agricultural advisory officers are usually the link between the research station and the actual stockowner.

57,887. In this country?—In this country and of course in America. It is the adviser who has helped in the eradication of tuberculosis in various States.

57,888. Coming to your own work here: in this country veterinary researches are carried on at the Royal Veterinary College and other institutions; what led to the establishment of a new institute for the purpose in Cambridge?—That is a question which I am afraid I cannot very well answer; I really do not know what led to the establishment of this institution, but I have no doubt that Sir Thomas Middleton could tell you.

57,889. Do you think the close association of research organisations in the Universities is advantageous to both?—To the University and the institution, undoubtedly, yes.

57,890. Further, the Institute of Animal Pathology in Cambridge is of great help to the agricultural students?—Yes.

57,891. So that this association of veterinary research with the University is a help to both research and training?—Yes, undoubtedly.

57,892. From where do you get your financial support for the Institute?—That comes from the Development Commissioners and is administered through the Ministry of Agriculture. I may say I belong to the University and that I am loaned as Director of the Institute.

57,893. Now about the preparation of serum: how are these sera distributed to the stockowners? What is the agency for the distribution?—In this country we are particularly fortunate because we have a large number of veterinarians and they really act as distributing agents.

57,894. *The Chairman*: In private practice?—Yes; but in the North of Scotland, where there are very few, and in the North of England, we have to make use of agricultural organisers, of veterinary advisory officers, of whom we have several, and sometimes, as I say, actually the stockowner himself; otherwise we could not get the stuff used.

57,895. *Professor Gangulee*: The private practitioners pay for the serum?—They pay for it, yes.

57,896. But apart from the private practitioners, how do these sera reach the cultivator if he cannot get the service of a private practitioner? Is there any direct connection between the Ministry and the stockowner?—Between my department and the actual stockowner there is always direct communication without any link at all, because I have a research department which deals directly with stockowners if necessary.

57,897. And you charge for the expenses incurred in connection with this serum?—Yes, in supplying material like serum or tuberculine we do make a small charge.

57,898. When you investigate problems such as that of foot-and-mouth disease, which is a very important problem in this country, at several research centres, what organisation have you to co-ordinate such activities?—We have a Research Committee which meets at intervals; a number of research workers are employed by that committee; they are detailed to work on certain lines, and they make frequent reports to that committee.

57,899. So that you have one definite committee for that particular problem?—Yes, we have definite committees for most diseases which we are investigating.

57,900. On such problems you are in touch, for instance, with Northern Ireland?—Yes, we should be in the case of Northern Ireland.

57,901. And also Scotland?—Yes, certainly.

57,902. What is your organisation for carrying on extensive field investigations?—Even in a country as small as England it is impossible to get materials sent to a central place; therefore when I came here I started a motor laboratory, and my organisation admits of the collection at a moment's notice of men working in different fields of research and sending them out to investigate in the field; they can sit there for two or three months and carry out their work actually on the spot.

57,903. *Mr. Calvert*: Granted a system such as we have in India, where you have Government veterinary officers in charge of outlying dispensaries and hospitals, then above them administrative officers, and then a certain number of research officers, would you recommend the recruitment of research officers *ad hoc* for research, or would you draw them from the general cadre?—I think it is preferable to have your research officer actually as a research officer and not to draw him from the general course. I may perhaps quote the system which obtains in the British Army at the present moment where men do a very short term in the research laboratory and then are supposed to know all about research work. Other men are brought in who know nothing about it, and they are supposed to take up research work in the state in which it was left and carry it on efficiently. I do not see how it can be done.

57,904. In recruiting research officers we should look for men of higher qualifications than the ordinary men recruited?—Yes, I certainly think that is wise; they should be men who have had experience in laboratory work.

57,905. If you have this separate cadre for research workers, would there be any counterbalancing draw-backs in having an administration separate from research?—I do not think so.

57,906. Would you then have separate cadres for research and administration?—Yes.

57,907. You do not think there would be any friction?—No, I do not think there would; I do not see how there could be.

57,908. You would recruit the research workers at an older age than your general cadre?—Yes, they would want to be a little older, in any case, to have done their post-graduate work.

(*The witness withdrew.*)

The Commission then adjourned its public meetings until 2.30 *p.m. on Tuesday, the* 2*nd August,* 1927.

Tuesday, August 2nd, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. F. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Professor S. H. GAIGER, F.R.C.V.S., University of Liverpool.

Replies to the Questionnaire.

QUESTION 15.—VETERINARY.—(*a*) In my opinion the best can never be got from the Indian Veterinary Service until it is placed under the control of a Director-General with the Government of India.

No system of dual control in matters involving contagious diseases can ever be successful, and the appointment of a Director-General should involve removal of district officers in the Provinces from control by Directors of Agriculture.

The position of the old Inspector-General was that of a mere figure-head. He had no district officers and no schools directly under his control. The only men directly under his control were those on the staff of the Muktesar Laboratory. District staffs only took orders from the lay Directors of Agriculture, and if an expression of views by the Inspector-General was interpreted by any of these staffs as an instruction to act, the Directors of Agriculture took exception and explanations had to be offered by the Inspector-General. This led to a state of affairs bordering on the farcical, the post of Inspector-General became a sinecure and was eventually abolished.

I believe that better work will be got from the veterinary officers by working under a professional man who understands their difficulties in the fight against disease, and who can discuss the work with them, than by working under a lay head.

(*d*) The policy against contagious diseases must be one of centralisation of control if it is to succeed, and not of decentralisation as at present. Preventive measures against animal diseases in India must be directed by one head, more especially if, as the Questionnaire suggests, there is some thought that the time may have arrived to introduce legislative control. Legislative control of disease can only be effective if uniform for the whole of India. An analogy to this is found in this country where the continuance of the old Board of Agriculture Veterinary Service is necessitated by outbreaks of contagious disease, and where it is found impossible to separate

Scotland from England for these purposes, or divide the country into counties with different regulations. The chaotic state of meat inspection in England, as compared with the uniformity of the Scottish system, serves as another illustration of what is possible and impossible with regard to diseases.

It would be a waste of money to appoint another Inspector-General, but a great step forward would be to appoint a Veterinary Director-General, with such deputies and staff as he might require to make his central organisation effective.

The teaching schools might be semi-independent of the Director-General's organisation. They are probably better left under Provincial Government control with a Principal and specially-recruited teaching and research staff, but there should be some liaison between the schools in the various Provinces and the Director-General. The schools need a Veterinary Inspector of Schools to keep them up to standard. His recommendations and observations would be made through the Local Government.

(*g*) Yes. I do not advocate an extension of the Muktesar Institute except in so far as this is necessary to provide for a larger output of biological products. I fear it must now be admitted that it is almost impossible for much research to be done by the Muktesar staff, other than that which bears on the development and improvement of laboratory products for field immunisation. The output of the Muktesar Laboratory has to be so enormous that the staff, of necessity, becomes buried in routine, and even if a special research staff were employed it appears to me more than doubtful whether any one man could effectively direct so much routine and at the same time guide a large output of research work.

I would advocate the setting up and extension of accommodation and staff for research in the various schools. I think it would be a mistake to set up provincial institutes specially for research. I am of opinion that better results are turned out by research departments of teaching institutions than by institutes devoted solely to research, provided the research staff of teaching institutions is not overburdened with teaching duties. One cannot divorce teaching and research without both suffering. Teaching without research is dead and uninteresting. Research without a certain amount of teaching is apt to be narrowed and restricted in outlook. The research worker cannot step aside and look critically at his results unless he has to impart the new knowledge to others.

I think accommodation and all facilities should be provided at the Muktesar Institute for research workers from provincial institutes to take their investigations there, if they wish to, during the summer term and vacation months when the hot weather renders laboratory work almost impossible in the plains.

(*h*) As already indicated, I am of opinion that a policy of decentralisation of research will give the best results.

I think the best results will be got by carrying out any special investigations, say in the Punjab, with research officers from the research department of the school in that Province, rather than sending officers from the Mukfesar Institute for that purpose.

It is quite impossible to accomplish as much in a vast area such as India by centralising research in one institute, as can be accomplished by encouraging research in every centre where there is a school.

Oral Evidence.

57,909. *The Chairman*: Professor Gaiger, I think you are Professor of Veterinary Pathology at the University of Liverpool?—Yes.

57,910. You have had considerable experience in India. Will you tell us the particulars of your service there?—I went out first in 1906, and was for some six months on the administrative side of the Civil Veterinary

Department in the Punjab; then I was transferred to the staff of the Punjab Veterinary College in Lahore, where I taught Pathology and was in charge of the Contagious Diseases Ward, as it was called. I remained on the staff till I finally retired in 1914. I had to leave the Government of India service because I got laboratory infection at my work; and during those eight years I was some three years on sick leave. During that time I spent some of my vacations up in Muktesar, being specially delegated there for certain research work.

57,911. Have you had experience in other tropical countries?—I have been to South America, to do some work in Peru, up on the Andes; and I have seen a certain amount of animal disease in the West Indies.

57,912. I think you know, from the correspondence which has passed between us, that one of the matters in which the Commission is interested is the problem of the immunisation of cattle against rinderpest on a large scale by the serum-simultaneous method; and I understand that you would be willing to prepare a note which would give us a digest of the material at your disposal, and a statement of the position as you see it to-day. Could you do that for us?—I would be very pleased to do it. It is an immense problem to eradicate it from all India. On the other hand, to do it piecemeal simply allows the infection to return to the areas which are freed; but there are many technical difficulties in the way of mass inoculation.

57,913. You are probably familiar with the action that has been taken in Africa on this matter?—Yes. Rinderpest was getting into the South quite recently from Central Africa, and they managed to put a barrier of immune animals to prevent it spreading to South Africa.

57,914. In India, I take it that one difficulty about using the barrier method would be the transport of cattle from cattle-breeding territory to the non-cattle-breeding areas?—Yes, it would mean a very large staff and a considerable organisation to do it on that scale, with so many cattle as there are in India.

57,915. Do you think that much permanent good is likely to follow from the use of the serum-alone method?—No, I do not. I think it is only picking at the problem. With the serum-alone method you are bound to leave a portion of the animals still susceptible to the disease, which become infected later. The serum-alone method is simply a poor edition of the simultaneous method. You endeavour to infect on top of your serum by natural means, rather than by actually giving the disease by inoculation of virulent blood.

57,916. It has been suggested to the Commission from more than one source that the immunisation conferred by the serum-simultaneous method is substantially longer in time, in Egypt, than that conferred by the same method of inoculation in India. Perhaps you would address yourself to that point when you are preparing your memorandum?—Yes.

57,917. I observe you are in favour of centralisation of responsibility, so far as the control of veterinary diseases is concerned?—That is right. I do not think much good is to be expected unless the whole department throughout India is co-ordinated under some head who has the power. Under the old system there was an Inspector-General, who really had no power over the officers in the different Provinces.

57,918. Your suggestion would not meet the case of the Indian States, would it?—No, it would not touch the Indian States.

57,919. Would the fact of their existence be a serious limitation upon the efficiency of any all-India scheme which omitted those Indian States?—No, not if co-ordination were arranged for. The trouble in the past was that there never has been an effective head in British India, let alone in the Native States.

57,920. I see you are of opinion that veterinary research may properly be left to the Provinces to carry on; and you suggest that this research should be carried out in the veterinary schools rather than in veterinary research stations pure and simple?—Yes, largely. I think it should be developed in the different Provinces. I think it is still going on in Muktesar. If I may say so, I think research in Muktesar is very handicapped, from the fact that it has to be provided for out of the profits of the station, so to speak. They have no special research grant; the consequence is they cannot arrange for any definite programme with any prospect of carrying it through. They are up against the same difficulty that medical research was up against in this country, when there was a grant of 1d. per head of the insured population. They never knew what money was coming in from that, and the grant was stabilised by Parliament in the end; I think a fixed research grant would be a great help at Muktesar.

57,921. Do you regard the veterinary problems in India as being local in character?—They are local in the sense that they are provincial. It naturally follows, I think, in a country of that size.

57,922-3. The parasitology is vast?—Some parasites may be almost common to the whole.

57,924. Is that likely in the case of a country of that size?—I think many of the so-called animal parasites are likely to show a general distribution; but so far as bacterial diseases are concerned, there are certainly some of them which are almost limited to certain parts of the country, for example, hæmorrhagic septicæmia is very much a disease of the Punjab.

57,925. When you suggest that research should be carried on in schools rather than in institutions not connected with the schools, is that because you value the effect of teaching on research and *vice versa*?—I do. I feel very strongly that the one helps the other. The man who has to teach has to take up a very much wider outlook than the man who does not. If I may give a definition of a specialist which I came across the other day (and I think it is a very true definition): the specialist is one who gets to know more and more about less and less. I think that is a bad state to get into. Speaking from experience, I think it does the research man a great deal of good to have to teach his particular subject.

57,926. Have you had experience in teaching India students in Veterinary Science?—Yes.

57,927. What do you say about the quality of the men whom you have taught?—I think it is very poor indeed; at least, in my time, it was. I think the standard is going up; but the standard cannot go up much until the standard of general education is raised. At the time I was teaching there was no preliminary examination in general education at all. The men were simply selected.

57,928. *Professor Gangulee*: When was that?—From 1906. I did not teach after 1913.

57,929. *The Chairman*: Have you come across Indian students as veterinary students in this country at all?—Yes, I have had a few in this country. I had one last session, an undergraduate at Liverpool University; but you cannot judge by one, of course.

57,930. You are probably not in a position to speak about existing teaching in veterinary matters in India, or about the qualifications or the capacities of native students undergoing training?—Not at the present moment. I believe the standard is going up there; but the problem is the same there as it is here. We want to raise the status by raising the general education.

57,931. Do you think it advisable that Indians who have been trained in India should, if possible (I am assuming that they are promising men), come to this country or to other countries for the purpose of continuing their education?—I certainly think so. Without it one cannot look for

much progress. I think they want experience in other countries, just like graduates in this country want to get experience in other countries and in the Colonies. It is simply a case of broadening their scientific outlook and acquiring experience. I do not think they can get the same standard of post-graduate instruction in India which they can get in this country. For that reason alone, at any rate, if they are going to take teaching posts out there, they ought to come over here for post-graduate instruction.

57,932. *Sir Thomas Middleton*: To continue the subject of training Veterinary Surgeons, I think at the College which you knew at Lahore, the entrance has now been raised to the Matriculation standard and there is a four-years' course?—Yes, I think that is so.

57,933. Do you think that, in a four-year period, a student who has passed the Matriculation has sufficient time to qualify as a veterinary surgeon, always remembering that he has got to study in a foreign language?—Well, in this country it is a four-years' course to get the membership diploma for the Royal College of Veterinary Surgeons, but it is in the minds of a good many that four years is too short a period. I think a four-years' course in English for the Indian student is about as short as it could possibly be. It bears on what the man is intended for. If he is intended for district work in India it is sufficient; but if you are training the man for teaching posts, and the higher posts, and to do research work, then it is not enough.

57,934. I think provision is made for post-graduate work in Lahore at the present time. The four-years' course ends the training of the general practitioner?—Yes.

57,935. In view of the great amount of veterinary work that has to be done in India, and the difficulty of getting men who can qualify by taking a four-years' course of study, is there any possibility of having a shorter course for the subordinate service?—With what object in view?

57,936. With the object of increasing the number of men who are qualified to deal with the ordinary diseases that are met with in the districts?—I do not think there is much possibility of that if they are going to work on their own. If you mean simply to train men as inoculators against rinderpest, for example, that might be so, but a man placed in charge of a dispensary is better with not less than a four-years' course.

57,937. Do you think the difficulty of finding men for the work could be met by taking men who had gone through a shorter training and placing them under skilled supervision, so providing them with a period during which they were gaining experience in the field as against experience and training in college?—You mean with a view eventually to giving them responsibility?

57,938. Yes, on their own?—Without any actual completing of their course at college?

57,939. Without going through the complete four-years' course, would there be any possibility of shortening that course so as to increase the number of men who would be available?—I think you are on very dangerous ground in doing that. It is very difficult to shorten a course and turn a man out with a really intelligent grasp of what he is after. He cannot know physiology until he knows anatomy; he cannot know pathology until he knows physiology, and he cannot treat disease until he knows all three together.

57,940. We recognise we cannot turn out a highly skilled man without completing the course, but there is such a demand for veterinary treatment throughout India, and there is such a difficulty in getting fully qualified men, that one must try to think of some makeshift arrangement. When you were teaching, you were teaching students in a vernacular course which lasted for two years only?—No, for three years.

57,941. What became of those men who were your students?—They got posts in the districts under the Civil Veterinary Department. They were so much in demand that practically everybody who gained admission to the school could consider himself in the Government Service. There was a keen demand for them. There was no difficulty in their getting work. But, according to the standard which we now have in view, those men would not have been qualified when they left after a three-year course in the vernacular. We were always deploring the state in which we had to turn them out in those days. They were not the best by any means.

57,942. I quite recognise that the position is far from ideal, but the question arises whether it is better to have men of the description you yourself taught, or no men at all?—Well, it all depends what you are aiming at in India. Are you aiming at treating the agriculturists' animals at dispensaries, or are you aiming at any wider scheme of eradicating a disease such as rinderpest?

57,943. Even if we aimed at treating animals at dispensaries, the difficulty at present is that the dispensaries are far too few in number?—Yes.

57,944. And they cannot touch the bulk of the stock of the country?—No. I should think many dispensaries might be run by men with a certain amount of training, the training of a dispenser plus some years' experience, for example, and if they had inoculations to do, special training as inoculators, but I do not think you should put all dispensaries in charge of men who had gone through an inferior training.

57,945. Who had gone through the three-years' course that you were responsible for?—Yes.

57,946. In fact, your students now are, no doubt, in charge of dispensaries?—Yes, but then we are always aiming at something better, and we recognised the difficulties in those days and would avoid a return of them.

57,947. We are still aiming at something better, but if you cannot get what you aim at, the question is what can you do with the resources that are available?—Do I understand that the men are not coming forward?

57,948. The numbers are very small in proportion to the needs?—In my day they were very poorly paid indeed. It was not sufficient to attract a University graduate. That may have some bearing on the smallness of the numbers, but I do not know much about that.

57,949. I think pay has been largely increased since your time?—I am not aware what the pay is at present.

57,950. The new course at Lahore is recent. I think the second year's entrants only completed their course this term, and one does not know to what extent the new course will be taken advantage of, and the tendency in the Punjab, at the present time, is to demand a higher standard of entrance qualification?—Yes.

57,951. The First Science examination instead of Matriculation? All that makes it more difficult to get men?—That applies all the world over, to a profession that is growing. This is a new profession, comparatively speaking, and the standard was low to commence with. The standard of entrance to the medical profession is always going up and up in order to meet the need for better quality. The same applies to us, although we may be just a shade behind the medical profession. I take it that the same thing applies to the Indian student. They realise that, in tackling disease, they need men of better general education and better professional education, and they are always trying to raise it. In my time out there we were very dissatisfied with the men who came forward. They were such that we could not set a written examination to them. The examination was all *viva voce*. Being in the vernacular, they were limited in their reading to books that were written in the vernacular. Many of those books were very good, but then their literature was strictly limited; they could not read English.

Professor S. H. Gaiger.

57,952. We are all up against this difficulty of quantity versus quality, and estimating the relative value to the country of quantity versus quality. I want to get your view, because you have had experience in teaching students when they were of indifferent quality. Do you think that more use could be made of men of this type under existing Indian conditions?—Why not have some system like they had in combating rinderpest in South Africa? They had fully trained men, and they had a trained staff of inoculators I understand, though I do not speak from personal experience.

57,953. *Mr. Calvert*: I think the point Sir Thomas is really trying to get at is a medical point. You recollect that, in the Punjab, we had assistant surgeons, fully qualified medical men, and hospital assistants who were not fully qualified medical men. Sir Thomas Middleton is asking you, would you like to see a grade of less qualified men if you cannot afford to have your assistant surgeons?—I see no reason why not, but you would not consider a hospital assistant qualified to be in charge of the district or dispensary.

57,954. There is a burning question whether compounders should be allowed to do private practice?—Yes, it does raise all sorts of questions.

57,955. *Sir Thomas Middleton*: On the question of simultaneous inoculation, we understand that the use of blood from the living animal involves a great many risks in Indian practice?—Yes, it does. It may convey disease other than rinderpest to the inoculated animals, piroplasmosis, for example.

57,956. Do you consider the risk a serious one?—They are getting losses from piroplasmosis. For that reason where they use the simultaneous method of inoculation they confine their efforts to young animals, which are not so susceptible to piroplasmosis, but I think with further research they might find some means by which they could eliminate the danger.

57,957. I was going to put that point. Is there any possibility of substituting for the blood of the living animal some artificial preparation?—Work, I think, is being done on parallel diseases at the present time in that direction.

The Chairman: More in the direction of getting living virus from the blood of an animal that does not suffer from piroplasmosis.

57,958. *Sir Thomas Middleton*: I was thinking of some artificial preparation which would be safe, and could replace the blood of the living animal?—The only reason for using the blood is not to get the constituents of the blood, but to get the virus which lives there, the virus being present in the blood in considerable quantity.

57,959. But with that virus you run the risk of introducing other diseases?—Yes.

57,960. Is there no possibility of preparing a virus in a form in which it could be introduced in a pure form, or without dangerous contamination?—That is what all the world is working at at the moment, to find some means of cultivating artificially some of these various viruses. If we could find some means of growing them artificially we could get rid of any danger of piroplasmosis, but there is very little work being done on whether one could add something to the blood, after drawing it, which would be fatal to the piroplasm and which might leave the rinderpest virus still alive and virulent. That is a direction in which there is room for research. At the same time, if you prepare your rinderpest virus from animals which are free from piroplasmosis (and it is difficult to find more than a small percentage which are free), then you eliminate that risk.

57,961. If one were to resort to serum-simultaneous inoculation on a large scale, apart from the actual difficulties of administration and providing the serum, etc., the most important point to consider is the percentage of deaths that one must expect to follow?—As a result of inoculation?

57,962. Yes. I understand the presence of piroplasms in the blood of the living animal is one of the chief causes of the risk of death?—It is one of the causes—I suppose you would call it one of the chief causes, but certainly another of the chief things that has had to be watched, which would have to be left to capable men to control, is the regulating of your dose of serum with your dose of virus, because the one counteracts the other. If you give too much serum you get too little reaction from your virus. Then, it is necessary to use a potent serum. If you do not have a sufficiently powerful serum you produce rinderpest by means of your virus. It is balancing one against the other that is the whole art of the simultaneous method.

57,963. In the work which was done in South Africa in the immunising cattle of part of the country, one of the most uncertain points was the death-rate which followed the effect of the serum simultaneous method?—Yes.

57,964. And the cause of the death-rate?—It is a serious method of inoculation. For example, in Madras, about the time that I finished in India, a number of imported animals were inoculated by the serum-simultaneous method, and there was a very considerable percentage of deaths. This method has been shown to be safe in some countries where the doses have been properly regulated, where they have gone cautiously and developed the method. There really is no reason why it should not be carried out safely.

57,965. Perhaps, in compiling your note, you might deal specifically with the question of safety?—Yes.

57,966. *Dr. Hyder*: How long does the immunity last? Have you any experience of that?—It is an active immunity; that is the object of doing the simultaneous method. The most active immunity lasts from 10 months to a year. In round figures, you generally state that active immunity will last for a year. I think that applies to rinderpest.

57,967. After that the animals will have to be re-inoculated?—They will have to be inoculated annually. The immunity is a diminishing quantity. It means yearly inoculations unless you systematically get rid of the disease as you advance over ever-widening areas. Haphazard inoculation against rinderpest in India will never get rid of the disease. You have to clear areas and join up the areas.

57,968. You adopt the serum-simultaneous method and you advance along areas. Supposing there is no contact with areas which are not inoculated, or from infection from other sources, then immunity last for ten months to a year?—There would be no re-infection under such circumstances.

57,969. If the operation were not repeated after the expiry of one year, how long would the period of immunity last?—Immunity is rather an indefinite quantity. It is diminishing. Some animals might be immune for eighteen months. Some might be susceptible again inside of a year. If there is no source of infection in your area which you have cleared, then there is no risk to those immunised animals. That is how it has been done in other countries. The virus does not live for any length of time, more than a few days, outside the bodies of the living animals. By clearing your area you get rid of the disease for good, unless you reintroduce it into that area.

57,970. For how long are those animals laid up when you inoculate them? How long are they unfit for work?—It is a matter of a day or two, when they should be all right again. One would not work them during the

period when there was a temperature reaction, but it is only a matter of a day or two.

57,971. *Mr. Noyce*: In your statement you say: "District staffs only took orders from the lay Directors of Agriculture." Were you thinking specially of the Punjab conditions there?—Yes, the Punjab is really all I have experience of, but I think it applies all over.

57,972. It does not apply to anywhere now except the Punjab. The Punjab is now the only Province in which the Veterinary Officers are under the lay Directors of Agriculture?—Do they report direct to the Government now?

57,973. Yes, they are directly under the Minister?—I see.

57,974. I suppose that would go some way to meet your objections. I should like you to explain, if you would, exactly what you mean by the "policy of the centralisation of control concerning contagious diseases." Is it your view that the whole of the preventive staff should be directly under an officer of the Government of India and that it should be entirely taken away from the Provincial Governments?—What is wanted is a uniform system. If you look on the Provinces as an area such as we are talking about, it is no good having one system in one area and another system in another. They might be fighting a disease in one area, in one Province, and leaving it alone in the other, and so allowing for reinfection. That is what I mean by uniform control. It is the same in England. You could not deal with Scotland apart from England. You could not eradicate a disease in Scotland and leave it alone in England, because it would spread from one to the other. The same thing applies to the Provinces in India.

57,975. It is merely the control of the system?—Yes.

57,976. Not of the organisation? You would leave the entire control of the organisation with the Provincial Governments?—You could do so, but control of the system means control of the organisation, does it not? The two are practically synonymous in my view.

57,977. If you found one Province neglecting a disease and another Province taking energetic measures against it, the duty of the Director-General under your scheme would be to call the attention of the Province to the fact and tell them to get on with measures against it?—That is so.

57,978. He would not necessarily be in control of the staff which had to deal with it?—Then if he is not he can never move the staff from one part of India to another, I presume, to deal with any special emergency that might arise.

57,979. I take it you have followed the course of events in India, to some extent, in recent years?—Yes.

57,980. The Local Governments now have entire control over these matters?—Yes.

57,981. It would be rather a revolutionary idea to introduce a staff into a Province which was not under provincial control to deal with what is at present a purely provincial matter?—Yes. Different people have different views as to the advisability of that, as far as disease is concerned.

57,982. We want your views?—My view is that nothing could be worse for animal diseases in India than the de-centralisation which has taken place. There is no head. There is no one to whom the veterinary officers can look for professional help and advice. Practically, they are all working on their own, and in different centres, and there is no unity whatsoever.

57,983. As regards the question of research at Muktesar, I gather it is your view that research is a provincial matter rather than a central matter. Although you want measures against contagious diseases to be centralised, you consider that research should be provincialised?—Well, that is not quite my meaning. I think it is a bad thing to expect results applicable to the whole of India from one centre like Muktesar. I do not think any one station can do the amount of research work that is

waiting to be done. When I say that research should be developed at the different centres, it is largely with an idea of getting round all the different problems. One school will take up one set of problems and another school another set and so on, by mutual arrangement and co-ordination.

57,984. In view of the fact that the money to be spent on veterinary work in India is somewhat limited, do not you think it might be advisable to spend it on one institute rather than scatter it over several?—Of course, in the schools you have a staff already there, that with a very little more assistance, could do quite a lot of research work. In the Punjab College, for example, there are very fine laboratories indeed.

57,985. The Punjab is exceptionally fortunate in that respect?—Yes.

57,986. The view has been put before us that veterinary disease is a matter which can be dealt with at a central institute rather than at a number of provincial institutes. The problems are not quite so local in character as they are in agricultural research, for instance?—I do not think the problems can be dealt with in that way in this country, and this is a much smaller country than India. It has been found that it cannot be done here. The problems of Scotland could not be tackled by the previously existing institutes, and an institute was started there. The animal-disease problems of Britain certainly could not be all undertaken by one institute, nor by any one brain.

57,987. The question is, whether an expansion of the central institute would not enable it to cope with all the problems?—At Muktesar you could provide for all the Provinces?

57,988. Yes?—My view is that it could not be done so successfully as by having research work conducted in each Province.

57,989. If you have research centres in each Province the difficulty arises of finding the men for them. You might possibly find the men for a strong staff at Muktesar under the Central Government, whereas it might be more difficult to find men for a research staff under the Provincial Governments, especially with the abolition of the Indian Civil Veterinary Service?—Yes. I quite agree. The difficulty is to find men for research, to fill the institutes which have arisen in this country, because the men cannot be made. They are really born to that kind of work. They have a natural aptitude for it, and you just have to hope they will arise. They are really the selected men from a number who are given opportunities for special training.

57,990. That is what I was bringing you to. Do not you stand more chance of getting a good staff for one central institute than for a number of provincial institutes?—To a certain extent, you do, but my point is this. If you have it all done at one institute you cannot get all the problems undertaken satisfactorily, because no one man can direct the amount of work that is waiting to be done.

57,991. On each particular problem?—On each particular problem—at least, I do not think so. There may be others who may say the opposite, but I am only giving you my view.

57,992. We can only expect to get your view, but I want to get on record exactly what that view is. What are your views about the suitability of Muktesar as a central research institute? I do not know whether the scheme was under consideration before you left India, but there has been in recent years a proposal to move to Bareilly, and part of the work done at Muktesar has been transferred to Bareilly or rather to Izatnagar. What is your view about that?—The advantage of Muktesar is that it is an all-the-year round centre, whereas Bareilly gets atrociously hot in the hot weather, and the hot weather militates very strongly against doing research work. There is a great deal of work which, from its very nature, cannot be done at that station. They have two stations at the present day; there is a branch laboratory at Bareilly.

57,993. On the other hand. Muktesar has the great disadvantage of inaccessibility, which you must have realised, having lived there?—Yes, that is a serious disadvantage; if they were starting all over again I do not think they would do what they did in the past and build it up on the top of the hill so many miles into the Himalayas as it is. They could have got other places much nearer the plain. Kasauli for medical research is much more accessible. Muktesar is practically two days' journey from the railway, and from that point of view it is a serious disadvantage.

57,994. Barielly would be all right for research, but you would want Muktesar for manufacture?—It has been used the other way round. Bareilly is used for manufacture, and Muktesar is used as a storage place for laboratory products and for research.

57,995. If you consider the whole year is necessary for research, you would have to start new research institutes in the hills in all the Provinces because the present research institutes are in the capitals?—Yes, research can be carried out at the colleges for eight months out of the twelve.

57,996. You could do that at a centralised institute like Bareilly?—Yes, I suppose you could. I do not think the Punjab has quite such a long period of hot weather as Bareilly.

57,997. Probably not?—In Lahore we used to reckon we could keep going for eight months, and then difficulties came in the way.

57,998. If you were to take up research on a serious scale at Lahore, do you consider that they would want a subsidiary research institute in the hills?—I do not think so.

57,999. *Sir James MacKenna*: When you were in India, colleges were very low-staffed. Generally speaking, there was only one member of the Royal College of Veterinary Surgeons on the staff. With reference to that idea of yours of provincialising of research and extending it at provincial colleges, could you give us a rough outline of the sort of staff that you would regard as adequate for the wants of those Indian provincial colleges, both for teaching and research?—I should start off by giving the Professor of Pathology sufficient subordinate staff to take some of the teaching off his hands. He would have to direct the work of his department and keep it up to standard as far as teaching goes, and, with assistance, he could do that and direct a considerable amount of research himself, pretty much on the system that research work is done at the Universities at the present time. The Professor in charge of the department has one or two lecturers who carry out his ideas of instruction, and he has a certain amount of time to devote to research.

58,000. What other staff do you consider necessary for the adequate equipment of one of these Indian Provincial Colleges? What would you regard as the minimum staff for a fully-equipped college?—Do you mean European staff?

58,001. Members of the Royal College, not necessarily European?—I think three or four is the minimum in a school like Lahore. We had three; I am not sure whether we did not have four. We had three, at any rate, in my time, and I was instrumental in getting two more appointments made, but the difficulty has been that men have been moved off or come home, and they have never really been fully staffed out there.

58,002. In the four would you include Professors of Pathology, Anatomy and Surgery, or would any subjects go together?—Yes, medicine and surgery.

58,003. You would have one man for that?—It could be done.

58,004. Pathology?—Bacteriology and pathology go together; I think I should have one member of the Royal College for each year in the curriculum. I have not really thought out which subjects to select for each one to teach, but I should have thought that you would require one senior teacher for each year, which would be the minimum you could do with; that would be four in a four-years' course.

58,005. That would be a staff of four Professors?—Yes.

58,006. Have you any ideas about a similar staff at Muktesar, on the manufacturing and research side?—I should not like to say that without a more intimate knowledge of what they are doing at present and what is in contemplation. I have read all the reports, but would require more information.

58,007. Who was there in your time?—I was there in Dr. Lingard's time, at the beginning, and then Major Holmes took over from him.

58,008. *Professor Gangulee*: When you suggested decentralisation of research, perhaps you had this in mind: that local investigation of animal diseases would furnish you with local knowledge?—Quite so.

58,009. But for fundamental researches you require a central organisation?—Well, if you put men for research in different Provinces, they are bound to take up the problems that are most round about them. That naturally follows always.

58,010. Through the Provincial research institutions we get local knowledge of a particular disease?—Yes.

58,011. But you would agree with me that there are numerous fundamental veterinary problems, such as those you have referred to arising out of the inoculation problems, and also problems of contagious diseases generally?—Yes.

58,012. Take the instance of the investigations into the nature and mode of trypanosomiasis, which have not been carried out in India, these are problems for a central research institute?—Yes.

58,013. No provincial authority can take them up efficiently?—No, they are too big. You must have central research going on as well. I trust I did not give the idea that it should all be localised.

58,014. The process of decentralisation of research would depend on the technical and financial resources available in the country?—Yes.

58,015. You know the conditions of India pretty well. These fundamental problems that I have just referred to can be undertaken by a central institution both efficiently and economically?—Yes.

58,016. Your idea of decentralisation of research is then limited to the extent that you want local investigation?—Quite.

58,017. Assuming for the moment, that all these Provinces in India have developed various research centres, then you would require a co-ordinating body?—Yes. You would want some method of co-ordination to avoid overduplication. Although a certain amount of duplication is a good thing, you do not want programmes to be precisely the same at two or more centres.

58,018. I see that you advocate centralisation of control in matters affecting contagious diseases, and I want to clear up a point that Mr. Noyce asked you about. Your idea is that the central agency will maintain their own staff in the Provinces?—Yes.

58,019. The members charged with the control of contagious diseases will not be under the Provinces?—I would say, no. The question of who is going to pay them is all connected with that; and that is outside my province altogether.

58,020. What grade of veterinary personnel would be suitable for the purpose of controlling diseases? Would the ordinary graduate from the Punjab Veterinary College be suitable? Assuming for the moment that the veterinary personnel are to be under the central agency in charge and in control of contagious diseases, I want to know from you what would be the qualification or the type of personnel you would like to see?—Well, I suppose you will have grades in the service in any case; you will have senior and subordinate grades.

58,021. I was really thinking of the qualifications you would wish to see in a Veterinary graduate charged with the task of controlling diseases?—

That is a little difficult to say. I do not think that the graduates of the Indian schools are sufficiently qualified to hold senior posts, unless they have done special work after qualifying. One does not know what is going to be led up to in the future. The schools have not got a sufficient staff, for example, to train men of the standard that you can get by training men in this country. You can send them to the Tropical School in this country, where they get a special knowledge of tropical diseases. All that must come in as post-graduate instruction. One would not say the graduates of schools in this country were the ideal unless they had done post-graduate work. One can only hope, in the four years' training, to train a man up to a certain point. He has got a very good groundwork on which to build. The nature of the post-graduate work that he does will depend on the line he is going to take up.

58,022. One of the greatest difficulties in India, as you know, is to have an efficient agency for the notification of disease?—Yes.

58,023. Have you any suggestion as to how this difficulty may be solved?—So far as I know, there are no Diseases of Animals Acts out there even now, except in very small localities like Calcutta, where they have a Glanders Act, and include some other diseases under it. But unless you get some system of notification, you do not get very far towards eradication.

58,024. That system should be uniform?—It should be. The law as to contagious diseases of animals should be the same for the whole of India.

58,025. You are in favour of legislation?—Yes.

58,026. If you had legislation, it would be on the lines of the Diseases of Animals Acts, in Great Britain?—It would be; but it would have to be modified for India.

58,027. One of the specific points in those Acts is the empowering of a central body to draft orders for dealing with certain diseases scheduled under those Acts?—Yes.

58,028. That is an important point?—Yes.

58,029. Do you think the time has come for a systematic campaign by the forces of Government of immunising against rinderpest?—Yes.

58,030. For that campaign, what would you require? I suppose in the first place you would require a staff?—Yes.

58,031. Do you think that legislation would be necessary for that campaign?—Yes, a certain amount of legislation would be necessary, otherwise you would not hear of the cases of disease. Rinderpest is one of the most easily eradicated diseases, given a proper campaign, that there is in the world. There was a large outbreak in the neighbourhood of Antwerp, recently, from a cargo of Indian cattle that called at Antwerp. It was some little time before it was diagnosed, and the disease got well inland; but it is all gone now. The experience in Africa was just the same. It all depends on this: The virus cannot live for any length of time except in the bodies of live animals. You could not advocate a slaughter policy in India, but there are other things you could do, compulsory inoculation; but you want to proceed rather cautiously with that.

58,032. With regard to veterinary education, it was suggested that India should have a central college for higher training in veterinary science, so that the men of the higher service could be obtained from graduates trained in the country. Can you express an opinion on that question?—No, I should not think that was a very good idea. I have not really thought it out, but, subject to that comment, it does not strike me as a good idea, because you have the difficulty of staff, and the difficulty of getting specialists in each particular branch for such a school.

58,033. For the senior grades of the service, you think we ought to look to people outside India?—Yes.

58,034. We have to look to England for efficient veterinary officers?—If you want to train a man to be really a Parasitologist, for example, you have to send him to this country, or to schools on the Continent, where you

will get the very latest training. You will not get men who have reached the top to go out to India. There is plenty of room at the top of Parasitology, like there is in any other subject, and they are only to be found in Britain, in Europe and America; so that you will have a very considerable difficulty in organising a post-graduate college of that kind.

58,035. Do you think it is not important that entrants to the Royal College of Veterinary Surgeons in this country should undergo a course of training in India before entering the Service?—I do not think so, for this reason. You can study many of the Indian diseases in this country, if you go to the right place to get them. For example, before I went out there in 1906, I was well acquainted with most of the Indian diseases, with many of them through taking the post-graduate course at the London School. Most of those diseases can be got at any large laboratory centre in this country.

58,036. My difficulty is this: In Lahore, as you know, we have got one of the best equipped laboratories in the world in matters of veterinary science, and have we not, there, the facilities for training post-graduates?—I grant you that. I think that the Punjab College, as it stands at present, is perhaps the best equipped school in the world; I should think it is second to none. But the school and the equipment are quite another matter to the staff. It is no injustice to anyone at Lahore to say that the staff is not such as can be found in Europe. They are not specialists in each little branch, such as you find in the schools and in the Universities in this country. Really it is the teacher who counts much more than the room he is working in and the apparatus.

58,037. Given the necessary staff. Lahore College could be developed into a post-graduate institution?—Given the staff, there is no reason why it should not be the foremost; but you will have great difficulty in getting the staff, of course.

58,038. *Mr. Calvert*: I gather that you would separate the staff dealing with contagious diseases from the staff dealing with ordinary dispensary work?—Could you make that a little clearer? Do you mean the superintending staff?

58,039. The actual worker: You would have one staff to man the dispensary and a second staff to deal with diseases?—You mean in the districts, at each dispensary?

58,040. Yes, in each district?—You see, if you are dealing with inoculations against rinderpest, one man could control a very large area with a staff of inoculators; but that is work which is rather different from staying at a central place and being a dispenser and treating the injuries and wounds of animals that are brought in.

58,041. Could the two staffs be on the same cadre, and interchangeable?—I think they might; but I should want to think over that.

58,042. A proposal has been put before us that the Civil Veterinary Department should be in control only of the contagious diseases; and the work of running these dispensaries should be handed over to the District Boards and left there?—I think that is a very good suggestion. I have always been a little dubious (one does not want to criticise) about the value of the work in some dispensaries, where they are simply sewing up wounds, or dressing something with a little iodine, and so on. That does not really call for a great deal of skill. In India one wants to be getting on to the veterinary work from a wider aspect, namely, the getting rid of some of the contagious diseases. I know it is a big problem and a difficult one, but there are two kinds of work which are totally different, as you know; treating fractures, injuries and things like that, and dealing with contagious diseases on a larger scale.

58,043. Taking the total number of veterinary officials in India, of all grades, by far the greater proportion are dealing with the dispensary work?—Yes.

58,044. You would like to see a larger staff on the preventive side?—Yes, quite.

58,045. On the matter of research, I gather you would link together the college and the research work?—Yes.

58,046. And then you would have your administrative section together?—Yes.

58,047. You have said that the research worker requires further study than the ordinary man passed out of the College here?—Quite.

58,048. Would that mean two separate cadres in the higher ranks, one for ordinary administration and one for research in the college, or could they be interchangeable?—Separate cadres in the same grade; not interchangeable. I think the man at the head of the Province, controlling disease, requires as much special knowledge in his line as the specialist in research. It is just as much highly skilled work.

58,049. Hitherto the recruits have been taken for the Civil Veterinary Department?—Yes.

58,050. They have not been for research or for colleges or for administration separately?—No; but I think if you want to get on with research, you want to look round for men who are obviously cut out for that kind of work in this country, and appoint them.

58,051. It might be necessary to recruit men specially for research at a somewhat later stage than that at which you recruit for administration?—Yes.

58,052. *Mr. Kamat*: You have stated, in your memorandum, your view about the policy of decentralisation of research; and you have also said that it would not be necessary to set up provincial institutes specially for research. Now, as you know, there are Provinces in India, like the United Provinces, or Assam, where there are no veterinary colleges at present. To have complete decentralisation for research purposes, what would you suggest for those Provinces? They have neither schools, nor colleges, nor research institutes?—I think, for many years to come, it would meet the case if research were developed at the existing colleges. If there was then found to be a need for still more research you could develop colleges where they want them; but I think research naturally goes with colleges.

58,053. That is to say, you would expect the United Provinces to depend upon Lahore?—Well, they depend on Muktesar at the moment for research. Muktesar is in that Province, is it not?

58,054. Take another case: you would expect Assam to depend on Bengal for research as well as administration?—Yes: if it was found that they were not supplying the need, then you could have a research centre specially for Assam.

58,055. Do I take it that to apply this ideal of complete decentralisation you would not require each Province to have its own college and its own research in that college? Are you against that?—I do not think there is need for any more colleges in India. There is a new one coming along in Burma at present. There are Calcutta, Madras, Bombay and Lahore. I think they ought to meet the needs of India.

Sir James MacKenna: At Patna there is a separate one.

58,056. *Mr. Kamat*: In your opinion, in spite of your decentralisation idea, it is not necessary that each Province should have a college?—I should say, No, I think the number they have at present is sufficient.

58,057. Are you in favour of compulsory castration; and, if so, by legislation?—You are getting into the problem of improving the breeding, are you not?

58,058. Yes?—There are the same difficulties in this country. Would it be practicable to have compulsory castration?

58,059. That is my question to you?—I do not think it would. I do not think the country is sufficiently advanced for that.

58,060. You do not think it is a practical proposition at present?—I should hardly have thought so.

58,061. To do castration under this system on a fairly large scale, do you think it is a feasible proposition to train veterinary assistants by a short course of instruction in castration, so that they could be sent out for work in the villages?—You can train men to any special pieces of work like that, inoculation or castration, by means of a very short course. In fact it is by so doing that you get the agricultural community to appreciate veterinary science, as a whole, very much better. In this country, for example, the practitioner always prefers to deal with an agriculturist who has been to an agricultural college and had a few months on a course in veterinary science.

58,062. So you are in favour of a sort of veterinary hospital assistant, trained in a short course in castration?—Yes, I do not think you can do without something of the kind. That was rather different to what Sir Thomas Middleton was asking me. His idea was a shortened course for men in charge of dispensaries.

Sir Thomas Middleton: Yes.

58,063. *Professor Gangulee*: Recently you have extended the Veterinary Department in the University of Liverpool. May I ask from what source you have derived the financial support?—The new Chair was formed from private benefactions.

58,064. Did you get any assistance from the Development Fund?—We got a certain grant of money towards improving the buildings of the Veterinary School from the Development Commission; and we hope to get, as it is practically outside the maintenance grant for education, a certain amount of money for research from the Ministry of Agriculture.

58,065. *Sir James MacKenna*: Is the Veterinary College attached to the University of Liverpool; or is there a Chair of Veterinary Science?—There are two Chairs of Veterinary Science. The School is part of the University.

58,066. It gives Degrees in Veterinary Science?—We give a degree as well as train for the M.R.C.V.S. The degree is not a licence to practise; it is simply an added distinction; it extends over five years, a year extra.

(*The witness withdrew.*)

The Commission then adjourned its public meetings till 10.30 *a.m. on Thursday, the 4th August*, 1927.

Thursday, August 4th, 1927.
LONDON.

Present:

The MARQUESS OF LINLITHGOW, D.L., (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.
Mr. NOYCE, C.S.I., C.B.E., I.C.S.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } *Joint Secretaries.*

Mr. EDWARD A. FOLEY, Ph.D.

Oral Evidence.

58,067. *The Chairman*: Mr. Edward A. Foley, will you describe, exactly, the nature of your appointment in London?—The nature of the post is more or less one of the divisions of the Department of Agricultural Economics Foreign Service. It has to do with the general study of American exports of agricultural products to the United Kingdom and to Western Europe. It also is a liaison office between the Cotton Exchanges of Europe and the Department of Agriculture of the United States, and also of the Grain Exchanges. It might be noted, for instance, that all the American cotton is sold under what are known as universal standards; and the universal standards are manufactured in the United States Department of Agriculture at Washington.

58,068. What is the exact title of your own post?—Agricultural Commissioner.

58,069. I would like to ask you one or two questions as to the assignment of responsibilities between the Central Department of Agriculture in the United States and departments of the several constituent States. Is it the case that the assignment of that responsibility is not very definite as between those two elements?—No, it is quite definite; and rests upon the Constitution of the United States and the Constitutions of the various States. The United States Department of Agriculture has no jurisdiction over any produce which does not enter into the inter-State trade. All internal relations belong to the States themselves. Where the relations cover more than one State, they come under the jurisdiction of the Department of Agriculture. That strict line of demarcation, however, is somewhat broken down by the co-operative connection between the States and the Department of Agriculture.

58,070. In the field of research, what is the policy of the Central Department?—In the field of research the Central Department of Agriculture is a sort of what might be called super research bureau; and it assists, as far as possible, both with men and with money, the various State organisations which are devoted to research. They do that in many ways: either by keeping in Washington a set of men who are the best in their line and assigning to them work in various States; or in various research institutions in various States.

58,071. The Central Department also, I think, carries on research in its own institutions, which are spread about the country?—Yes, it has its own research bureaux in different part of the country, which are Government affairs, and parts of the Department of Agriculture.

58,072. The organisation of agricultural research as between the State and the Federal institutions is arranged, is it not, by the States Relations Bureau of Agriculture?—Yes, which is part of the Department of Agriculture.

58,073. Does the Federal Department claim the right to inspect the work in the institutions where either research officers in the pay of the Central Department are working, or where the Central Department is spending funds?—Always.

58,074. Does that lead to difficulties?—Not at all; it is an entirely co-operative matter. When the course of study or the course of work is laid out primarily, it is presented to the Department for approval, and the United States Department insists that a high standard of work be maintained.

58,075. Is there jealousy or friction between the States and the Federal authorities in the matter of agricultural research organisation?—None at all. It must be explained that, in almost all research, the bounds of the subject are so large that they spread into various States, and the individual States would find considerable difficulty in doing it alone.

58,076. *Professor Gangulee*: Is the difficulty a difficulty in reference to finance?—No, it is a difficulty in reference to distance. The United States is about 4,000 miles wide. One part of the problem may be in San Francisco or in Los Angeles, in the case of oranges or citrus fruit, and the other part of your problem may be in New York, which would be the ultimate market.

58,077. *The Chairman*: Has the fact that first-rate investigators are few and far between any bearing upon this question of the Federal organisation carrying out important research in that that there are not enough first-class men to man the research departments in every State?—That is very true. The big demand is for the top men in research work. Frankly, they are not to be had in any abundance. The difficulty in all the big research stations is to get men who are really capable of doing the work assigned, because a great deal of it is more or less pioneer work.

58,078. So that if every Constituent State of the Union insisted upon having all research carried out in its own institutions, it might be that the level of work would drop, owing to the difficulty of finding a sufficient number of first-rate investigators?—That is not a matter into which I would care to go very deeply. I know in general that good investigators are scarce, but it is not my type of work. I have not had anything to do with that. My scope is entirely the marketing and legal side of it.

58,079. The need for a central authority to deal with the problems of the external market is obvious; but how about the functions of the Central Department in inter-State marketing and trading?—The Department of Agriculture's economic work in America lays special stress on grading. We have established grades for wheat, cotton, and so forth. Those grades are universally accepted through the States. They are the basis of all business in the States. It is a development which commenced in the State departments of agriculture, and was assisted by the United States Department; the apple States graded their apples, the cotton States graded their cotton. Later, the United States Department correlated these grades, and made grades that were universally accepted. After the experience of business running through a few years had shown that certain grades were workable they were adopted by the department at Washington; and from that development the second step naturally was some inspection, to ascertain whether things were graded or not graded. A large amount of business was done in what we call shipping point inspection, and the department found it necessary to have inspectors in various States to inspect and decide whether the various commodities were according to the established grades at the time of shipment

from producing centres. So we have now a very complete Inspection Service in the various commodities which have been graded, such as wheat, cotton, and so forth.

58,080. Take the cotton-growing States. The standards adopted for America are common to all those States?—The standards for American cotton are now common throughout the world. Not only the States in the United States, but also all the European Cotton Exchanges use what is known as the universal standards. Those standards are manufactured in the United States Department of Agriculture. They are passed by a Committee from the various European exchanges before they are sent out for use by the various European and American exchanges. Copies of those standards are sold throughout the United States and Europe. I would say there may be 1,000 or 2,000 sets of the standards sold throughout the United States and Europe.

58,081. Turning to the apple-growing States, have you there standards which are common to all apple-growing States?—In the apple-growing States the standards are a little different because of the difference in the varieties of apples; but the various States have their own grades, which the Department of Agriculture inspects.

58,082. Have you the same grades for export as you have for internal consumption at your larger terminal markets?—We have no export grades in apples. The regular State grades are the grades which are used for apples.

58,083. It is a universal grade?—Well, the apples in different States vary; and when they are shipped abroad, they are always shipped according to the standard of the various States from which they come.

58,084. Does the Federal Government interest itself in the other grades? —Absolutely; almost all apples sold in the internal trade, and a great many in the foreign trade, are inspected by the Inspection Service of the United States Department of Agriculture. A great quantity of apples are bought, say, f.o.b. Washington by a firm in England, and these firms will specify inspection by the Department of Agriculture at the shipping point or arrival point.

58,085. Are certain containers standardised?—We also standardise a great many containers. The work on containers is going forward. It is not by any means a finished problem.

58,086. The action of the Central Department in administering these matters does not lead to friction between the department and the department in various States?—No, because the States realise that the Department of Agriculture is trying to solve their problem.

58,087. Have you interested yourself in the development of the co-operative movement in the United States?—Quite a little, but that is not my speciality.

58,088. Is it the policy of the Government in America to encourage the co-operative movement?—It is encouraging the co-operative movement in this respect, that it assists the co-operatives in the solution of their problems.

58,089. Do the Government in the United States finance propaganda in favour of co-operation?—No, we do not.

58,090. Is the demand for long-term credit for the purposes of improvement of agricultural holdings satisfied by the existing supplies of credit in the United States?—Yes, I think so.

58,091. Are land mortgage banks common?—Mortgage banks are quite common, and the agitation for credit is for short-term credit. I think the long-term credit and intermediate credit situation is pretty well met. In fact, I think some of the intermediate credit banks have been closing for lack of demand.

58,092. Have you any knowledge of the reputation that Indian agricultural produce enjoys in the markets of the United States?—No, I have not. To be frank about it, I do not think there is a great deal that goes to

America from India. Quite a few hides go there, but the principal Indian exports do not.

58,093. *Mr. Noyce*: You take a certain amount of jute?—Yes.

58,094. *The Chairman*: And I think a certain amount of ground nuts?—Yes.

58,095. Are those systems of elevators owned and managed co-operatively by the wheat-growing farmers?—I do not think they are exclusively owned by co-operators. There are co-operative elevators, but I would not like to say that the majority are co-operatively owned.

58,096. Are you familiar with the working of the elevator system in detail?—Not generally.

58,097. *Sir Thomas Middleton*: The position in the United States is that each State has its own experimental station, I think?—That is the State position.

58,098. There are some 50 to 56 stations?—Something like that.

58,099. When the Agricultural Department of the United States began to develop research, their first action was to establish a station in each State under the Hatch Act?—That is more or less in connection with various State Universities.

58,100. In connection with State Universities or Agricultural and Mechanical Colleges, as they were called?—The Agricultural and Mechanical Colleges were usually part of the State University system.

58,101. The Hatch Act provided 15,000 dollars for each of these institutions annually?—Yes.

58,102. There were very considerable difficulties in the direction of finding men for the first ten years of the existence of the stations?—That is quite true. In the beginning there seemed to be a feeling that the scientists did not study agriculture; but scientific development has progressed more in recent years.

58,103. The State departments quite definitely appreciated the situation in the five-year period after the grants had first been made under the Hatch Act?—Yes.

58,104. They set themselves to train men. As soon as the trained men were available, a further Act, called the Adams Act, was passed?—Yes.

58,105. In order further to endow research?—Yes.

58,106. The appropriations at the present time under the Hatch and Adams Acts amount to something like one and a half million dollars?—About that.

58,107. The main object of the research under the Hatch and Adams Acts was productive research?—That is quite true. The primary object was the increasing of production right through.

58,108. Within the last ten or fifteen years, and particularly since the War, your department has paid special attention to agricultural economics?—That is under Secretary Wallace, who took a particular interest in agricultural economics, maintaining that the agricultural economist's work had been neglected, and that the time had come to find out just where the money was made and where it was lost. He always considered that that was where the agricultural economist would prove his worth.

58,109. With the experience which the department had in the development of research, there was introduced into Congress, I think in 1925, a further Act called the Purnell Act, to develop research?—Yes.

58,110. In that Act, specific attention was drawn to the need for economic research?—That is quite true.

58,111. That Act provides an annual appropriation of two million dollars?—Yes.

58,112. So that the appropriation under those three specific Research Acts at the present time is about 3,300,000 dollars?—I would not pretend to state what the actual amount is, but I am quite sure that is near enough.

Mr. Edward A. Foley.

58,113. These are the figures from the last Appropriation Act. In addition to those funds specially intended for research work, there were large "States Relations" appropriations?—Yes, the Smith Lever Act.

58,114. The Smith Lever appropriation was a permanent appropriation, I think?—That is true.

58,115. As a matter of fact, the permanent appropriation under the Smith Lever Act was supplemented in the last annual Appropriation Act by a sum of 1,300,000 dollars, so that about one-third was added?—That can be added; and it might be that next year the Congress would feel that more work had to be done, and they would increase it, or they might feel the economy wave and decrease it.

58,116. The intention of the Smith Lever Act was to secure a continuous policy?—Yes.

58,117. Congress, by a vote to-day, cannot bind Congress ten years hence?—No.

58,118. *Dr. Hyder*: To quote from Dr. Wiest's book on Agricultural Organisation in the United States, "Many bureaus of the Department of Agriculture exist solely by virtue of the annual Appropriation Acts, and would become disestablished by the mere failure of Congress to provide funds for their continuance without repealing any existing Statute"?—That is the constitutional position.

58,119. *Sir Thomas Middleton*: Dr. Hyder has referred to the constitutional position. In fact, does that danger ever arise in connection with a subject like agricultural research?—Not unless by inadvertence.

58,120. The appropriation for the United States Department thirty years ago was about 2,500,000 dollars, and the funds available are now about 153,000,000 dollars. There is not much sign of retrenchment in that department?—Well, I think people feel that they are getting value for their money.

58,121. Under the States Relations services, a large amount of co-operative work is done?—Yes.

58,122. In addition to this work, the Secretary for the United States Department appears to have a fund for his own co-operative extension movement?—That is in the Department of Agriculture. In the Bureau of Agricultural Economics the Secretary has what is known as the Department or Division of Co-operation, and that consists of men who have rather a close knowledge of the co-operative movement, and who give their time to solving various questions which are pertinent to the co-operative associations alone. Certain new problems come up to be reckoned with affecting all these co-operatives, and these men are employed to do what they can to solve them.

58,123. That is in addition to the five million dollars which the United States Department has for the Bureau of Economics?—Yes. I do not know very much about that fund. As I say, I do not pretend to know the inner fund working of the department.

58,124. My point is that the Bureau of Economics, which is now a very extensive one, does not cover all the work which is being done by the United States for the co-operative movement?—Oh no. At the Bureau at Washington there is a great deal of field work being done. They recently made a survey of several thousand co-operatives to find out what were the principal causes and principal weaknesses in the co-operatives that caused their failures, in cases of failure. They were getting out statistics as to how many had failed owing to lack of proper management and how many had failed through the lack of proper finance, and so forth.

58,125. Going back for a moment to the fifty odd experimental stations which receive three and a third million dollars as grants from the United States Department, they have, in addition, State funds at their disposal?—Well, those are what are known as the Land Grant colleges. Under the

constitution of the various States, certain public lands were set aside for the purpose of founding those various colleges. As many of those newer States had no funds, the Government assisted in establishing State Universities, or State Colleges there.

58,126. In addition to the value of the property which they originally had, do they not get money voted by their State Legislatures for their work?—Yes.

58,127. I suppose you could get for us what sort of proportion the central grants bear to the total expenditure of those experimental stations?—Yes, I would be delighted to get it and forward it to you.

58,128. I mentioned a moment ago that the total appropriation, plus certain funds for the Department of Agriculture, was something like 153,000,000 dollars, but of that sum 77,000,000 dollars is for the roads?—For the Road fund.

58,129. So that the net sum available for agriculture and forestry is something like 76,000,000 dollars in the current year?—Yes.

58,130. The demand in respect to the roads has extended very rapidly in the United States in the last 20 years?—It has practically doubled yearly

58,131. The responsibility for roads existed 30 years ago when the Secretary for Agriculture had only 2,500,000 dollars at his disposal?—That is very true; but we did not have the automobile at that time.

58,132. That is the difference?—I think one can say, without fear of contradiction, that the money spent on public roads has probably been the most profitable investment the United States Government has made.

58,133. Does the department supply men to work in a State college, or within the State, as whole-time servants of that State, or do the men remain members of the department?—It is a sort of dual relationship. For instance, the State of California, within the last three months, wanted a chief of their Marketing Division. They came to the Department of Agriculture and said they would pay a large proportion of the salary of one of the members of the department. A member of the Department of Agriculture, the Chief of the Fruit and Vegetable Division as a matter of fact, accepted that position. He is entirely subject now to the State of California. The Government of the State of California pays his salary, or rather, a major portion of his salary; both departments pay it.

58,134. He has been seconded for service in California?—Yes.

58,135. Is that service for a limited period?—It is for a few years. I do not know what the period is. He does not lose his precedence in Washington by reason of the fact that he is in the State of California's employment, although he does lose his position as Chief of the Bureau

58,136. You have for your Bureau of Economics about five million dollars available. Do you ever make money grants out of that appropriation to institutions, or does your assistance consist entirely in lending men?—We make no grants to institutions outside of the Department of Agricultural Economics, that I know of.

58,137. Can you tell me whether all the grants which reach the separate States come under the vote for the office of the Secretary (about 8,875,000 dollars this year), or whether money grants might also be included in the Votes for the Separate Bureaux?—That question I cannot answer. I do not know anything about the internal running of the department in that way. I know more or less their method of action, but I have never been in that section of the department and I would not be qualified to testify to it. If you put the question in the form of a question and answer, I will send it to Washington and have it answered. I think that would be the quicker and better way.

58,138. Thank you. There has been, in the past six years, a very great increase in the marketing of fruits and vegetables in the chief markets of the United States?—That is true; it is going up by leaps and bounds.

Mr. Edward A. Foley.

58,139. To what extent is that due to propaganda in favour of the consumption of fresh vegetables and fruit—a continuation of the War propaganda?—That is a very difficult question to answer, because there are many factors, and the *post hoc ergo propter hoc* argument is everlastingly coming into the solution of that question. There was a great deal of propaganda such as is going on in England now, of "Eat more fruit," and eat this, and eat that. Much of it was started by ourselves in the Food Administration in War time, to induce people to get on to the foods that could not be transported abroad. At the same time, coincident with all that, there has been a great era of prosperity in the States and an enormous increase in the buying power of the people. So it is very difficult to say what is the exact cause of it. The various fruits and vegetables in the States have been standardised, the trading in them has been made easier for the merchants, the distribution has been enlarged, and the distributing plant has been enlarged.

58,140. You have mentioned two factors of which I recognise the importance, one is the improvement in marketing, and the other is the great increase in purchasing power, but the third factor which I want to get your view on is the extent to which producers are being affected by the very valuable advice that the agents of your Bureau are giving them all over the United States as to what they ought to grow in the near future?—There has been a great deal of experiment and a great study of production abroad, and also production in the various States. The farmers in the United States are coming more and more to the study of crop reports and crop plantings, and crop areas. Of course there is always an indefinite return, due to the uncertainty of the weather in relation to the crops, but the farmers are now realising more and more that they have a certain figure to reach. The United States can grow so much corn profitably, but after that point there is likely to be difficulty, and therefore they are trying to follow the plan outlined by Secretary Wallace, Secretary Jardine, and others, by which the department would be able more or less to indicate to the farmers what they should plant, and approximately the areas they should plant.

58,141. You have for a long time had Crops and Markets publications which tell every farmer what prices are?—Yes.

58,142. Is this new publication "The Agricultural Situation" an attempt to summarise the trends and to focus the views of your advisers as to what the future is likely to be?—That is exactly what it is.

58,143. This is an attempt to be one year ahead of the markets?—Yes, from the agricultural point of view, giving the farmer some idea of what he should provide in the coming year.

58,144. This seems to me to be a most valuable production, from the farmers' point of view?—In other words, it was felt in the Bureau, in all the various commodity lines, that there was a considerable amount of information that was not collated together and placed in one publication where the farmer could get it all on very short notice, without going through a large mass. That was the reason why that bulletin was started.

58,145. You have only started to print "The Agricultural Situation" quite recently?—Yes, it is one of the most recent publications of the department.

58,146. *Dr. Hyder*: The agricultural activities in the United States of America are confined to three forms. First, there is the Federal Department of Agriculture, secondly there are the State departments of agriculture, and thirdly you have private organisations?—Yes.

58,147. What are those private organisations? Could you name them?—They are State universities.

58,148. I said "private organisations"?—We have, in different States, Universities which are not State Universities, like the Leland-Stanford University in California. In the Leland-Stanford University there is a

Food Research Institute. That is an institute which was founded by Mr. Hoover and others for the purpose of continuing a lot of scientific work which arose in Food Administration during the War.

58,149. Then you have powerful farmers' organisations, grain and other movements, and the Farmers' Alliance?—We have the grain movement and any number of organisations, in every State. Some of them come up and flourish for a while, and then disappear. Others have quite a long existence. Probably the grain organisations are the most important of the private institutions of that type. We also have organisations which are doing research work on their own account, like the organisations of the Fertiliser Manufacturers. They are running their own office in Washington. Then we have the Milk Producers' Association of New York which has research workers working on the questions of condensed milk and better milk, and matters of that type. In fact, almost all industries in the United States have central organisations that maintain research departments.

58,150. With regard to the organisation by the State (by "the State" I mean Federal as well as the individual States) the legal basis in your Constitution for undertaking agricultural activity is to improve education for the general welfare of the United States?—That is the legal basis.

58,151. On that legal basis, obviously the appropriations by Congress are for purposes which cannot be regarded as local?—No.

58,152. But general and national?—They must be extra-territorial. The easy distinction between the State and Federal activity is that the State has everything to do inside the boundaries of the State, but it cannot go outside of its own boundaries. The United States Government has control of all the relations which exist between one State and another—which exist outside the confines of the individual States.

58,153. And between foreign countries?—Yes. The United States Department of Agriculture would have no jurisdiction as to the growing of fruit which would be sold inside the State of California, or wheat which would be raised and sold inside the State of California, but the fruit or wheat which would be sent to New York or to Nevada, or to Kansas, would immediately come under the jurisdiction of the United States Department of Agriculture.

58,154. What are the functions which the State departments of agriculture undertake. The one as to inter-State agricultural matters is clearly a double function. What is left to the States, apart from this work which you have just mentioned?—There are all the various functions of education, such as the County Officers and the economic workers, and people of that type. Also, in the State of California, there is research into citrus disease, and work of that type; in forestry work there are the tree diseases; and there is also cattle disease work.

58,155. Cattle disease is left to the State?—Of course the United States Department of Agriculture has cognisance of disease that may spread from State to State, and the inter-State shipment of cattle, but there is also local research work and protection work. In California they had recently an outbreak of foot-and-mouth disease that was discovered by the State Veterinary Officer and his people. As soon as he discovered it he notified Washington, and then he turned it over to a Joint Committee consisting of the State of California and the United States Department of Agriculture.

58,156. Apart from those general activities of the Federal Government and the functions that are performed by the individual States, you have a sort of twilight area where it does not appear which authority is to undertake or initiate or supervise?—Yes.

58,157. How do you manage to get over the difficulty one encounters in such a twilight area?—Well, a twilight area of that type would be primarily the business of the State, because those areas would be entirely in one

State. The practice is that if a State cannot solve a difficulty, it appeals to the Federal Government for aid.

58,158. The Federal Vote for the Department of Agriculture is an annual Vote by Congress?—Yes.

58,159. Year by year?—Yes.

58,160. With regard to the Land Grant to colleges, they all undertake other work outside purely agricultural work?—Yes. They call them Agricultural and Mechanical Colleges. They have a mechanical side as well as an agricultural. They are really State Colleges. The main idea was that the State had to have its own College because of the size of the various States, and this grant of public land was made in order to provide the nucleus of the State University.

58,161. *Mr. Noyce*: You have a very elaborate system of crop reporting in the United States?—Quite an elaborate system.

58,162. Which endeavours to give the condition of the various crops at different times?—During the growing season.

58,163. Complaints were made to us in India that the results were not altogether satisfactory as far as the cotton crop is concerned. Would you care to say anything about that?—The forecasting of any crop is a very difficult proposition. There is no crop which can show more, or less, change in a week or two weeks than cotton. Two weeks of very good weather at the right time, or two bad weeks of weather at the wrong time, will make or break the cotton crop. There has been a great deal of discussion, particularly by those who wish to use the cotton crop for gambling purposes, on the cotton reports of the Department of Agriculture. At the same time, the agricultural interests of the United States, particularly the farming co-operatives, are entirely in accord with the position of the Department of Agriculture. The need of these crop reports came from the fact that a large number of crop reports were issued by private persons, and many of them were issued for their own purposes. The farmer had no crop report on which he himself could rest. Therefore Congress ordered the institution of a crop report on the cotton crop.

58,164. There were tremendous variations between the reports at different seasons last year. Do you consider that was due to the climatic conditions?—It was due entirely to climatic conditions. The crop reports indicate the amount of land which is planted to cotton, and the condition of the cotton plants at the time the report is issued.

58,165. I studied your crop report organisation in some detail when I was dealing with the question of cotton in India, and it struck me, as an outsider, that there was very little that could be improved upon. Are any steps being taken to improve it in any way?—It is a very difficult thing to handle, but every year we maintain that we are improving it. It is like everything else—it progresses. It must be enlarged every year, because of the enlargement of the cotton area of the United States.

58,166. Does the same system apply to other crops as well as cotton?—Yes, in a somewhat different way.

58,167. Each crop has its own special circumstances?—Yes.

58,168. *Sir James MacKenna*: What sort of problems does the Central Department engage itself with, apart from those taken up by the different States?—Well, taking wheat as an example, all American wheat is graded under the United States Department system of wheat grading, and all wheat sold to foreign countries is sold according to those grades and by what is known as the Certificate Final, which is issued by the graders under the supervision of the United States Department of Agriculture. Before this system came into effect, wheat was sold to Liverpool and was inspected in Liverpool, and the graders in Liverpool determined finally the grade of the wheat. Now, wheat is classed in the ports, and that classification is final as regards all foreign countries.

58,169. On the more strictly scientific side, are there any special chemical or bacteriological problems that the Central Department takes up?—Yes, they are working on all the major problems of agriculture. Foot-and-mouth disease, which broke out in California, is a recent example of how things are done. Within twelve hours there were some three hundred veterinaries from every corner of the United States on board trains for California.

58,170. That was arranged by the Central Department?—Yes. We are also working on the question of plant diseases, and everything of that type. That is to say, things of Continental interest.

58,171. By "Continental interest" you mean the whole of America is interested in them?—Yes, matters of agricultural interest which touch on all the States at once. We also assist where a big problem may arise.

58,172. You assist both with men and money?—Yes.

58,173. What sort of salary do you pay the members of the Agricultural Department—the botanist or chemist?—I do not know about that, but I can supply you with the scale of pay.*

58,174. *Professor Gangulee*: Who administers the funds under these various Acts that you have mentioned?—The Department of Agriculture itself administers its funds. In the case of State Relations that Bureau administers its funds. The various chiefs of the Bureaux administer the funds of the Bureau, and the heads of the Offices the funds allotted to them.

58,175. Are any conditions imposed in making these grants to the State colleges and State research stations?—That is not my type of work, and I am not thoroughly conversant with that.

58,176. I understand there are some private organisations carrying on research?—A number of private organisations.

58,177. Are those organisations assisted by the Federal or State funds?—No, those are entirely on their own. They are usually supported by trade organisations which have interests in their results.

58,178. Has this system of giving Federal aid to the States tended towards a reduction of State initiative and effort?—Not at all.

58,179. It has served to stimulate the States to greater activities?—Yes, and it has kept up the standard of the work done.

58,180. And to stimulate continuity of research?—Yes, which is rather an important thing.

58,181. Could you tell us the chief features of the Smith Lever Act of 1914?—I would not attempt to do that. I can supply you with the Act.

58,182. *Sir Thomas Middleton*: And also would you supply us with the Purnell Act?—Yes.

58,183. *Professor Gangulee*: Have you any knowledge of the demonstration farms in the United States?—I have some knowledge, but not very much.

58,184. I think Dr. Knapp in the Southern parts of the United States has introduced a system known as county demonstration conducted directly on the farms of cultivators?—Yes.

58,185. Could you tell us how that system is working?—No, I could not. I can get the information, but I do not pretend to be an encyclopædia of the department.

58,186. You are familiar, perhaps, with the organisation of the county agricultural agents throughout the United States?—I have some familiarity with it, but not a very close familiarity. I have never done any of that type of work.

58,187. Could you tell us what their specific duties are and how they are recruited?—They are usually recruited from the graduates of the agricultural colleges as county agents, and their work is usually to work with

* See Appendix, page 746.

the farmer individually and generally, and improve methods of agriculture. County agents must vary in their capabilities. One man will work in the fruit country, where he will have the fruit problems, and another man will work in the grain country, where he will have nothing but grain problems. In the grain country he will try and get the grain farmer up to date on the modern methods of cultivation and improvements in seed strains, and generally get him to increase the productivity of his land.

58,188. You have recently reorganised the extension service throughout the States?—Yes.

58,189. Who organises that? Is it done by the State or the Federal Government?—That is one of the questions I cannot answer. It is not my province at all. I can get you any information you want on the subject.

58,190. The supreme head of the Federal Department of Agriculture is the Secretary?—The Secretary of Agriculture.

58,191. He is responsible to Congress?—Yes.

58,192. He is advised by a body of advisers?—Yes; he has the staff of his department, which consists of the Bureau chiefs.

58,193. The chiefs of the Bureaux constitute a Council?—Yes.

58,194. He is aided by that Council?—Yes.

58,195. As to the Bureau of Crop Estimates, is it under the Federal Government?—Yes.

58,196. How does it establish its relationship with the States?—There is a statistician usually in each State, and the information is collected from a large number of collaborators in each county.

58,197. Are those statisticians paid by the Federal Government or by the State Department?—We have both State and Federal statisticians.

58,198. As to the Bureau of Markets, that comes under the Bureau of Agricultural Economics?—Yes.

58,199. That is also under the Federal Government?—Yes.

58,200. What is its relationship with the States?—We have to do with all produce entering into State commerce.

58,201. The work of this Bureau on marketing, I understand, has three aspects—first of all market investigations; secondly, regulation of markets; and, thirdly, demonstration of better methods of marketing?—Yes.

58,202. Supposing you are to carry on some investigation into the cost of production of wheat, how would you go about it?—Well, usually it would be done by the department people in Washington in co-operation with the various State department people in the various States.

58,203. They would have their own men in the States?—We might have one or two men from Washington going out there, but we would not have sufficient forces to go out and do work of that type.

58,204. So these investigations of the marketing problems are carried on with the collaboration of the States?—Yes; there is absolute co-operation between the Federal Department of Agriculture and the departments of the States. It is realised that both are trying to solve a single problem.

58,205. Turning to another subject: you have a Cattle Quarantine Act, how does that function in the States? Is any difficulty experienced, in giving effect to this Act, in the fact that you have fifty-two States to deal with?—Yes; but the cattle cannot pass from one State to another without coming under the Department of Agriculture, so that you localise your problem immediately. Our system is to assist the local authorities and have a complete embargo, so that we know very well that the railroad will not accept shipments of cattle from one State to another when the quarantine is on. The problem becomes relatively simple to locate in one State, and then to solve by co-operation with the local people.

58,206. With regard to the enforcing of Federal Acts bearing on animal diseases, the Federal Government maintains its own staff?—Yes.

58,207. In the States?—Yes.

58,208. *Mr. Calvert*: You mentioned, in reply to the Chairman, that the Indian trade with the States was comparatively small?—I think so, but I have never had any dealings with it personally.

58,209. Yet you maintain in India two commercial assistants to your Consul-General?—Yes.

58,210. At Karachi and Calcutta?—Yes.

58,211. And the United States regards that as a good investment?—Certainly.

58,212. For what you call a comparatively small trade?—I did not mean any comparison in that sort of way. What I really meant was this: that I had never had any dealings myself with the Indian trade in the United States which would enable me to give any opinion which would be of any definite assistance to this Commission.

58,213. I have been looking at your Federal Budget, and most of the expenditure comes under what one might call the unavoidable items of Defence and Public Debt. Defence and Public Debt account for most of your income, omitting Customs. Is it fair to say that your generosity towards agriculture is dependent on your tariff policy?—No, I do not think it has anything to do with it.

58,214. If you lost five hundred million dollars from import duties, do you think that the Federal Government could be as generous to its Ministry of Agriculture?—I think so, because it is entirely a business proposition. The money invested in research and in agricultural education in the United States has fully warranted the expenditure.

58,215. Assuming the United States adopted Free Trade, do you think the people would be prepared to tax themselves to maintain this agricultural expenditure?—I do not think there is any doubt about it.

58,216. *Mr. Kamat*: What is the general policy maintained by the Federal Government to promote agricultural industries, or to take the initiative in starting new industries?—I do not quite follow your question.

58,217. I am referring, by agricultural industries, to what articles may be manufactured from the raw agricultural material into finished articles?—Yes.

58,218. In the States do either the Federal Government or the State Governments take any initiative to promote agricultural industries by starting demonstration factories?—Would you give me an example?

58,219. Suppose you have oil seeds from which you can manufacture a certain finished product. If people do not know how to utilise them, is it the policy of the States or the Federal Government to establish a demonstration factory at the expense of the State for the information of the public?—I do not know that they would go so far as to establish a demonstration factory. I do not know of any such factory. I know that if we had oil seeds, the department would assist in every possible way to teach the people how to utilise them; but, as I say, I do not know of any factory ever having been built.

58,220. *Sir Thomas Middleton*: Has the Federal Department ever assisted canning factories or canning demonstrations?—I think they have done some work along that line in Maryland in tomato canning; but it is not a matter with which I am cognisant.

58,221. *Mr. Kamat*: On the question of transport of fruit, is it the policy of the States to give facilities in rates of freight, or any facilities for cold storage, in order to assist your fruit industry?—The freight rates of the United States are under inter-State commerce rules. We have nothing to do with freight rates. The Department of Agriculture has carried on a large number of experiments in refrigerators, such as icing in cars under various conditions for various periods of time, and it has done a large amount of research work in the changes which occur in fruit under cold

storage at various temperatures. It has also conducted a large number of experiments concerning the proper handling of fruit in transit.

58,222. Do I take it that the State considers it its duty to help in this regard?—Yes.

58,223. And in so doing the expenditure has been a good investment?—Yes, it has. In fact, we have a demand for the increase of that type of work all the time.

58,224. In the United States, does the Secretary, who is at the head of this Department of Agriculture, correspond to the Minister of Agriculture in this country as a Cabinet Minister?—Yes; he is a member of the President's Cabinet.

58,225. Is he responsible to Congress? Whenever he shapes his policy as to research or agriculture he must take the members of the dominant Party in Congress into his confidence, I suppose, so as to get supplies?—When he has formulated his policy he must get the appropriation from Congress to carry it out.

58,226. He is able to do that because he takes the members of Congress into his confidence?—Well, the members of Congress must realise that the work he is doing is of value, otherwise they would not appropriate the money for it.

58,227. He convinces as many of them as possible?—Yes.

58,228. *Mr. Noyce*: I do not know whether you realise that the Secretary for Agriculture is not a member of Congress. The Executive in the United States is entirely outside the Legislature?—Yes. As I say, he is not an elected officer. He is one of the President's Cabinet, but no member of the President's Cabinet is either a Congressman or a Senator.

58,229. *Mr. Kamat*: When he shapes his policy, and asks for supplies, does he take Congress into his confidence?—He must have a policy that commands public confidence, otherwise Congress will not appropriate money for his projects.

58,230. Whether he is a member of Congress or not, the fact is he takes Congress into his confidence?—He must go to Congress for all of the funds for carrying out the policy.

58,231. He does not snap his fingers at Congress?—No.

58,232. It means that the continuity of research depends on the reasonableness of the Congress from year to year?—That is quite true.

58,233. The roads are under the Ministry of Agriculture in the United States?—Yes.

58,234. That system works well?—It has worked very well. At least we can say that there is no popular demand for a removal of the public roads from the Department of Agriculture.

58,235. The two are run together: the Bureau of Roads and Agriculture?—Yes.

58,236. That is a great advantage for the purpose of marketing?—It is an enormous advantage, particularly with the modern development of the motor truck.

58,237. You told us that the Federal Department has experimental stations in the various States?—Yes.

58,238. That means when the Federal Government has the money to spend on research work it can open as many experimental stations as it may want within the jurisdiction of the States?—Yes.

58,239. This policy of carrying on experimental stations and extending them within the jurisdiction of the independent States is followed by the Federal Government with advantage?—Yes.

58,240. *The Chairman*: Are you making a great point of economic and market enquiries and surveys in the United States?—That work is going on all the time.

58,241. Does that involve the training of a special staff with both economic knowledge and agricultural experience?—Yes, in all our inspection services.

58,242. How are you training that particular staff?—The staff is recruited largely from men from the agricultural colleges who work their way up in the service of the department. Also, in a great many cases, we draw men from commercial sources who have commercial acquaintance with various trades with which we are working.

58,243. Is there growing up in the United States a literature in connection with the training of the staff in the special qualifications required and with the planning of these enquiries?—There is an enormous literature growing up. Indeed, almost every day a work is coming out on market service and how to make good that service in relation to the various markets.

58,244. Is there an official publication?—No; but there are endless books coming out.

(*The witness withdrew*).*

APPENDIX.

SCALE OF PAY IN THE UNITED STATES DEPARTMENT OF AGRICULTURE.

Professional and Scientific Service.

This service includes those positions the duties of which are to perform work which is based upon the established principles of a profession or science and which require training equivalent to that represented by graduation from a college or university of recognised standing. There are seven grades in this service and the corresponding range of salary is from $1,860 to $7,500.

Subprofessional Service.

Positions in this service are those the duties of which are to perform work related to that required in the professional and scientific service, and which requires professional, scientific or technical training inferior to that represented by graduation from a college or university of recognised standing. There are eight grades in this service, the salary range being from $900 to $3,000.

Clerical, Administrative, and Fiscal Service.

In this service are included all classes of positions the duties of which are to perform clerical, administrative, or accounting work or any other work commonly associated with office, business, or fiscal administration. There are 14 grades in the service and the salary range is from $1,140 to $7,500.

Custodial Service.

The custodial service includes all classes of positions the duties of which are to supervise or to perform manual work involved in the custody, maintenance, and protection of public buildings, premises, and equipment, the transportation of public officers, employees, or property, and the transportation of official papers. The salary range in this service is from $600 to $3,000.

Clerical-Mechanical Service.

This service includes all classes of positions which are not in a recognised trade or craft and which are located in the Government Printing Office, the Bureau of Engraving and Printing, and the mail-equipment shop, the duties of which are to perform or direct manual or machine operations, or to perform or direct the counting, examining, sorting, or other verification of the product of manual or machine operations.

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* For a supplementary note by Mr. Foley see pages 814-15.

Mr. C. D. GREENING, Manager, Agricultural Division of the Fertilizer Sales, Limited.

NOTE OF EVIDENCE.

Section 10 of Part II of the Questionnaire issued by the Royal Commission on Agriculture in India raises the two following points:—

Sub-paragraph (*c*).—The method advocated to popularise new and improved fertilizers, and:

Sub-paragraph (*e*).—Whether the effect of manuring with certain forms of fertilizers has been sufficiently investigated and with what result.

It is clear to us that before any effort can be made by anyone, whether on behalf of the Government or of a commercial company, to popularise any new and improved form of fertilizer, thorough investigations as to its value with regard to certain crops, localities and soils are of absolute necessity. Any form of propaganda which might be conducted before such investigation has been carried to a conclusion by provincial agricultural departments in India would not only be wasted, but, what is more important, would be an actual hindrance to the work of those departments in their work of improving the methods of agriculture in their various provinces, especially as regards the *Zemindar* or ryot.

Calcium cyanamide has only been readily available in India of recent years, during which period a very marked increase in the manufacture of this fertilizer has taken place. In 1913 the world's production amounted to only about 120,000 tons, whereas to-day the corresponding figure is approximately 900,000 tons. Owing to the recent nature of this remarkable development, agricultural experts in India have not had the same opportunity for subjecting cyanamide to that degree of research and investigation as has been possible with other forms of nitrogenous fertilizers, such as sulphate of ammonia and nitrate of soda. In this connection, it must also be remembered that calcium cyanamide has undergone important improvements in manufacture of recent years.

Our experience with calcium cyanamide in its present improved form under widely varying conditions of soil and climate, has convinced us that in a country of such vast extent as India, there must be localities and crops to which this particular form of nitrogen is definitely the most suitable. Our main reasons for coming to this conclusion are based upon the following special properties of cyanamide:—

(1) *Cyanamide is not subject to loss through leaching.*—When cyanamide is applied to the soil it is rapidly hydrolyzed and converted into urea. Subsequently the urea so formed is changed into other organic compounds, which are firmly retained by the soil. Thus, before the nitrogen supplied by cyanamide is taken up by the plant, these organic substances have to be further converted into ammonium compounds and nitrates. The slower soil action of cyanamide thus renders this fertilizer far less liable to loss through leaching than is the case with other nitrogenous fertilizers. Thus cyanamide offers distinct advantages under conditions of heavy rainfall or irrigation.

(2) *The Lime Content of Cyanamide.*—In addition to 19 per cent. nitrogen, cyanamide contains about 60 per cent. lime (calculated as quick-lime, CaO). Of this 60 per cent. lime, approximately 22 per cent. exists in the

form of free lime, whilst the remaining 38 per cent. is present as pure calcium cyanamide.

Both scientific tests and practical field experience have demonstrated the fact that the continued use of calcium cyanamide is an effective means of counteracting soil acidity.

As the price of cyanamide is based solely on its nitrogen content, the use of this fertilizer provides the cultivator with a definite quantity of lime free of charge.

(3) *Steady action of Calcium Cyanamide.*—By reason of the sequence of changes in the soil mentioned in paragraph 1, the manurial action of cyanamide is distinctly steadier and more gradual than is the case with other forms of nitrogenous fertilizers. From the practical standpoint the action of cyanamide may be described as being intermediate between that of quick-acting nitrogenous manures such as nitrate of soda and that of organic manures, such as waste cakes and meals.

It is felt that this property of cyanamide is of particular importance in a country like India where the problem of finding a suitable substitute or complement for expensive organic manures is of vital importance.

(4) *Effect upon Insect and Fungoid Pests.*—Our experience with cyanamide has shown that this fertilizer has a definite effect in checking the spread of insect and fungoid pests. The fact is, of course, well-known that crops grown on soils having a sufficiency of lime are far less susceptible to such pests than are those produced on lime deficient land. In this connection, however, we should mention that the action of cyanamide in counteracting the development of crop pests has been found to be more effective than might have been expected by the application of the quantity of lime present in a normal dressing of this fertilizer. It is thought that the reason for this result is to be found in the high state of chemical activity in which a proportion of the lime content of cyanamide exists shortly after the application of the fertilizer to the soil.

(5) *Effect of Cyanamide on the working condition of soils.*—On land where cyanamide has been used continuously for a number of years, definite improvement in the working condition of the soils has been achieved. Scientific tests have shown that the lime content of cyanamide has a definite effect in flocculating clay and thus soils that are normally difficult to work undergo considerable improvement by the application of cyanamide, which for this reason facilitates soil aeration.

(6) *Effect of Cyanamide on Alkaline Soils.*—Scientific tests have shown that calcium cyanamide has the property of improving the condition of alkaline soils, the alkalinity of which is due to excess of sodium salts. It is suggested that calcium cyanamide offers a reliable and economical means of improving the fertility of such soils which cover a considerable area in India.

(7) *The Low Unit Price of Cyanamide.*—In addition to the special properties of cyanamide already enumerated, the fact should be borne in mind that in purchasing cyanamide the Indian cultivator obtains nitrogen at a cheaper price per unit than is possible in the case of other nitrogenous fertilizers.

In conclusion, we would urge, in view of the already increasing use of nitrogenous fertilizers in India, that thorough investigations with calcium cyanamide be conducted at suitable centres. Such experiments would naturally be expected to produce results of the greatest practical value in districts where soil and other local conditions indicate that the use of cyanamide would be particularly effective.

Mr. C. D. Greening.

Oral Evidence.

58,245. *The Chairman*: Mr. Greening, you are Manager of the Agricultural Division of Fertilizer Sales Ltd.?—Yes.

58,246. Will you give us some indication of the nature of the organisation which you represent?—Fertilizer Sales Ltd. handles the surplus output of the European manufacturers of cyanamide other than the cyanamide manufactured in Germany. In a country such as Italy, which produces cyanamide, a large proportion of that cyanamide is absorbed by Italian consumption, but should there be any further production over and above what Italy absorbs, then we would sell it in those countries where we are operating. Actually we are operating, from the sales point of view, in all the countries of the world with the exception of Canada, the United States of America and Germany.

58,247. Are you drawing this surplus available for sale outside the country of production, from all Europe?—From all the cyanamide factories in Europe; that is to say, Norway, Sweden, Poland, Czecho-Slovakia, Italy, &c.

58,248. It is an international organisation?—Yes. The Company, Fertilizer Sales Ltd., has been formed rather over two years. Actually I believe the Articles of Association were signed in June, 1925.

58,249. Do you seek to work the Company's business at a profit, or are you simply selling for the constituent firms?—No; we are actually the selling agents for the firms. We are in business certainly with a view to making profits. It is an ordinary commercial concern. The organisation is divided essentially into two halves, namely, the sales organisation, and the agricultural division, which is concerned with the conduct of experiments and agricultural properties and uses of cyanamide.

58,250. The margin between your buying price and your selling price includes the element of profit as well as that of distributing costs?—Yes.

58,251. Are you associated with any other group or firm in India engaged in the sale or distribution of fertilisers?—Our main agents in India are Messrs. Shaw, Wallace & Company, of Calcutta. I believe that we sell a certain amount of this material through other agents in India, but it not being my department I cannot give you the names of any other firms except Messrs. Shaw, Wallace & Company.

58,252. Have you any connection with Brunner, Mond, or Chemical Industries, or the Ammonia Federation?—None whatever.

58,253. Has your concern considered the possibility of manufacturing cyanamide in India?—I think not. We are not manufacturers of cyanamide: we are selling agents for factories already in existence. I do not know of any special scheme in any case, that Fertilizer Sales Ltd. have considered with regard to the manufacture of cyanamide in India.

58,254. So that presumably the sale of calcium cyanamide manufactured in India would be in competition with your own concern?—I should imagine, in those circumstances, in all probability our Directors would come to some arrangement.

58,255. They would make some accommodation?—Yes.

58,256. Your concern is not engaged in any preliminary investigation in the matter of the possibility of manufacturing calcium cyanamide in India?—Not to the best of my knowledge.

58,257. Are you carrying out any experimental work in connection with the practical application of your fertiliser under Indian conditions?—Yes; since the Autumn of 1925 we have had an agriculturist in India who was first of all stationed at Madras, and secondly at Bangalore, Mr. Frattini, who has made arrangements for conducting a certain number of experiments. Up to the present time we have not got any very definite results from those experiments. I understand the seasonal conditions in India during the time have made it difficult to draw very conclusive results. The numbers of those experiments I can give you. During the season

1926-27, 140 experiments were carried out or were commenced, consisting of 15 on tea, 21 on sugar-cane, 19 on coffee, six on rice, 11 on cotton, 15 on wheat, and 53 under the heading of " Miscellaneous." Of those 140 experiments 40 experiments have been commenced in co-operation with the Agricultural Department in India.

58,258. Are Messrs. Ewing & Co., of Calcutta, in competition with you, or are you in touch with them?—I think we have done business with them, but I would not be quite certain.

58,259. Do the amounts of calcium cyanamide imported by you through Messrs. Shaw, Wallace & Company show much unevenness from year to year?—We have only been in association since 1925. For the season 1925-26 the consumption of cyanamide through our agents in India amounted to 902 tons, and in 1926-27 it amounted to 1801 tons.

58,260. It was suggested by a representative of another firm engaged in the distribution of fertilisers in India, that that firm would be prepared to make some contribution towards the cost of experiments on the practical application of fertilisers in India. Has anything of that nature ever been suggested to you, or do you think that your firm would look with favour on such a suggestion?—I believe some suggestion of the kind was considered by our firm, but I think that the suggested figure was rather in excess of what we were prepared to undertake at that time. Our proposals, for the reasons stated in our note of evidence, are to get actual practical evidence of the utility of cyanamide under agricultural conditions in India, and having got some evidence of that kind as a basis of working I think that Fertilizers Sales Ltd. would be prepared to expend an increased sum on propaganda, but until that definite information is forthcoming we do not think the time opportune.

58,261. Can you tell the Commission anything about the use of calcium cyanamide in other tropical countries?—Yes; we have foreign offices, offices of our Agricultural Division, established in Egypt and Japan and the West Indies. It was the results of experiments carried out in those countries on crops that are growing, in Egypt, for instance, that led us to believe that cyanamide would be an economy and would supply a means of securing increased yields for such crops in India.

58,262. *Professor Gangulee*: You have just stated you have made 140 experiments in India. Under whose direction have those experiments been carried out?—The official experiments are under the direction of the agricultural officers of the district. Take the first experiment that I have a note of. The Director of Agriculture of Bengal carried out one experiment on rice, one on jute, one on sugar-cane, one on fodder crops, and one on tobacco; the Director of Agriculture, Bihar and Orissa, carried out one; several were carried out by the Agricultural College, Poona; some at Government House Farm, Ganeskind, Bombay; the District Agricultural Overseer at Kopergaon carried out one, and the Agricultural Officers at the following places carried out some: Belapur, Baramati, Gurdaspur in the Punjab, Hansi in the Punjab, Lyallpur in the Punjab, and Oudh in the United Provinces.

58,263. Did you make any contributions towards the expenses of these experiments?—None whatever, beyond supplying the materials free and carriage paid, if the Station would accept it.

58,264. Do you carry on any propaganda with regard to the sale of nitrogenous fertilisers in India?—Yes, but, as I indicated in answer to the Chairman, our propaganda consists mainly in the arrangement of experiments. There has not been any special sales campaign.

58,265. The results of the effects of cyanamide on the various crops mentioned in this note are chiefly obtained from sources other than India?—Yes, mainly.

58,266. *Sir Thomas Middleton*: You mentioned Japan as being one of the countries in which you operated, but is not Japan one of the largest manufacturers of cyanamide?—Yes, but what they call their domestic cyanamide in Japan is a somewhat different product to our own. I think it is a form of granulated cyanamide. Our cyanamide is entirely powdered and oiled. Over and above their domestic consumption of domestic cyanamide, there has been a very ready demand for the material we import.

58,267. Outside Germany, Japan is the leading manufacturer of cyanamide?—I do not think so.

58,268. What country comes next in importance?—I have not the figures of the complete production of Japan before me, but Italy is manufacturing something like 70,000 or 80,000 tons a year.

58,269. The capacity of the Japanese factories is over 100,000 tons a year?—Capacity, yes; but you have not any figure of output. I do not know what they manufacture.

(The witness withdrew.)

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MEMORANDUM ON THE INDIAN SUGAR INDUSTRY.

I.—*The Development of the Sugar Industry in India.*

In preparing a Note on this subject, I would first refer back to the proposals made (1) By the Board of Agriculture in 1917, and (2) By the Indian Sugar Committee in 1920.

The former of these contains suggestions made shortly before I left India, and when I had a much more intimate knowledge of the country than I have at present. In a Note prepared for the Board and attached to its published proceedings, I summarized, province by province, my opinions regarding the possibilities of the extension of the white sugar industry; and concluded with advocating the immediate formation of a Sugar Bureau, for the overhauling of the whole industry, by subjecting it to a scientific examination in all directions. The following officers were considered necessary for the founding of the Sugar Bureau: factory expert, engineer, chemist, agriculturist and botanist. This list will, I think, have to be revised somewhat under present conditions, as mentioned below.

Sir James MacKenna, the President of the Board of Agriculture in 1917, may remember his remark, when expressing his approval of the idea of a Bureau, namely, that he "was disappointed that I had not gone much further."

It is not, then, surprising that the Indian Sugar Committee, three years later, made proposals of a much more ambitious character. These included a thoroughly equipped and well staffed Central Sugar Research Institute, with a Sugar school and small factory attached for training purposes, besides a net-work of sub-stations in all important sugar tracts throughout India. In addition, they considered it necessary, in the then state of the white sugar industry, to erect a pioneer Sugar Factory, capable of dealing with 1,000 tons of cane a day, and suggested that this should be placed in the Punjab, near to the United Provinces boundary. They did not enter into details, but estimated the cost of the Central Institute at £236,666 in capital expenditure, with a recurring £80,000 a year for running it: the sub-stations were supposed to be self-supporting. The Factory would, naturally, be much more costly, but it was presumed that it would be a paying, if not a highly lucrative investment.

During the past 10 years many things have happened, but little progress can be reported with regard to the two schemes outlined above, and I may be allowed to place the position, as I regard it at the present time, before the Commission.

To my mind, the present condition regarding all-India scientific research in the sugar industry is somewhat pathetic. The Bureau was, it is true, started without loss of time, and a Secretary was appointed; but this gesture of approval was not followed any further. Indeed, the Sugar Engineering Expert, existing at the time, was allowed to retire, and no successor was appointed. I have followed the reports of the Secretary of the Bureau, year by year, with great interest; and I would like to record my thorough appreciation of the work that Mr. Sayer has been able, single-handed, to carve out for himself, although new to the subject. Two of his lines appear to me to be of special importance: (1) The accumulation of a mass of information on the trade side, for the benefit of those engaged in the sugar industry, and (2) his most successful propaganda work on the Coimbatore seedlings in Bihar. That his services have been highly appreciated locally, is evidenced by the large sums of money placed at his disposal, for the necessary field scale tests and the multiplication of those seedlings which he considered worthy of extended growing in the tract.

The Cane Breeding Station is still in existence. After several years of hesitation, my assistant, whom I had specially trained to succeed me by placing him in charge whenever possible, was ultimately appointed as Sugar Cane Expert; and at last the section has been removed from its anomalous position and placed under the direction of the Agricultural Adviser to the Government of India. I have not much information as to the work being done on the station, beyond the brief Annual Reports (which I believe were not printed at one time), and an intermittent direct correspondence with the officer in charge. Besides this, however, articles have occasionally been contributed to the Agricultural Journal of India. Mr. Venkatraman appears to have continued the raising of seedlings with great energy and enthusiasm; and has been able to preserve these qualities in the work of his assistants: from the first, this enthusiasm of every member of the staff made up for the many disadvantages under which the work of the station was carried out. Considerable progress has apparently been made in the technique of raising seedlings, and I think that I may say with confidence that this is as well understood at Coimbatore as anywhere else in the world.

Summing up, then, the initial steps proposed for the comprehensive study of the Indian Sugar Industry, both in 1917 and in 1920, have not been taken, and the proposals have been side-tracked. I am quite aware that, in various directions, a good deal of work has been done locally in those agricultural stations in the provinces interesting themselves in sugarcane growing. This is no new thing, for such work has been going on for many years, and highly important results have from time to time been achieved. But latterly the reports of such work have not come my way, and I cannot discuss them. The immediate question to be considered is, whether we should be content with this slow, but steady improvement in the industry, or adopt a forward policy, and start afresh, with a properly-equipped Central Research Institution.

When, in 1917, the formation of the Sugar Bureau was first mentioned, I recorded my opinion that "if such a Bureau had been founded five or six years ago, some very large sums of money would have been saved, both to the Government and to private firms." Ten more years must now be added. The position of the factories has, I presume, improved, and they have, as was right and proper, been able to do a good deal for themselves; but this is not the case with the small cultivator and his problems, excepting in very limited areas.

Dr. C. A. Barber.

As to the future development of the Indian Sugar Industry, the necessity for a proper organization, both in regard to trade and economics, and in scientific study, need not be emphasized: it is admitted in all sugarcane countries that the measure of prosperity in the industry can usually be fairly accurately gauged by the completeness of the scientific department. In the suggestions which follow, I propose deliberately to leave out of consideration the white sugar section, as I have had little experience of this in India; besides which, a great deal of knowledge on the subject has been gained during the past 10 years, and for the latter part of this period one of the ablest of factory experts has been engaged in studying it on the spot. The white sugar industry appears to be in a satisfactory position. My work in India on the sugarcane has always been, first and last, for the benefit of the cultivator; although one cannot hide the fact that any general advance in indigenous field practice will be of immediate benefit to the factory.

In case a forward policy is decided on by Government, the first step to take it seems to me, will be the initiation of a detailed study, in each place where the cane is grown, of what I may call the capital of the industry. In this I would include: the kind of cane grown, the soil or soils regarded as best for the crop, the climate, especially as to the available supply of water, whether of rainfall or for irrigation, the implements used, whether in soil treatment, in harvesting the cane, in transport, and the machinery used for producing the raw sugar; to which might be added the character of the labour, the stage at which co-operation had arrived and the possibilities of raising capital, and the existing demand for any particular type of the product.

Concurrently, a comparative study would be made of the treatment of the soil in different parts, the methods of irrigation, the presence of pests and diseases in the fields and their relative importance, and the methods of crushing the canes, boiling down the juice, and making up the raw sugar for the market.

The mass of data obtained in this preliminary study should be collected in one central office, where it could be sifted and arranged; and, with this study as a basis, it would be possible to indicate in what directions any given locality is behindhand, and probably also what measures should be adopted to remedy this. And thus a series of "projects" might be formulated, one at a time, as to improvements which might be introduced in different places; and a definite propaganda started through any existing agency or, in its absence, by direct action, to bring home the advantages of any proposed change.

I consider the character of this propaganda an extremely important matter. And, to explain what I mean, I draw on an experience of my own a number of years ago. When, after a few years' work on the Samalkota farm in Madras, there appeared to be a reasonable certainty that we had obtained a hardy variety of cane, better than those being grown by the cultivators, we were faced with the fact that no one seemed to want it. All available forms of Government literature, down to district and village sheets, were utilised, but with little result. The people who received this literature appeared to know little of the subject matter; and it transpired on enquiry that it was chiefly valued as a cheap and ready means for teaching the children to read. At last, in desperation, I had a cart loaded with samples of the cane and, placing my chief assistant in charge, directed him to tour the district, visit all the chief cane villages, harangue the people in the evening after their labours, and leave only one cane behind him. The effect was somewhat unexpected: the first village would be 15 to 20 miles away (a day's journey), and next morning the farm was invaded by 19 carts which had travelled all night to purchase the canes for planting purposes. And, by the time that the missionary cart was emptied, the

demand was so great that we were entirely unable to meet it; and were in the happy position of being able to pick out the best cultivators and make certain stupulations as to the method of treatment. After this, there was of course no further difficulty: the fortunate owners of the new canes were able to sell all their next harvest for planting purposes. But we found it very difficult to carry out our plot experiments, for many canes disappeared, and sprang up as if by magic in fields to which none had been distributed; and, indeed, kinds appeared in the cultivators' fields which had not passed their probationary testing period. Naturally, we were very lenient in this matter. A very few years afterwards, it was estimated that 95 per cent. of the canes in the Godavari district had been replaced by the new station kinds; the small exception being a local cane which ripened early enough to fetch a very high price at a local festival.

Ever since this episode, I have recognised the importance attaching, not only to propaganda work, but to the right kind of propaganda. With the valuable cane varieties already produced at the Coimbatore Cane Breeding Station in hand, the most urgent need at present is their advertisement in ever extending circles; and this should, in my opinion, be under the direct control of the central office, although of course working in full collaboration with the provincial officers, and profiting by their local knowledge and experience in cane growing. But a great deal of this knowledge has still to be gained, before it can be definitely decided which kind of cane to spread abroad in each locality—work of a character similar to that done at Samalkota farm when it was first started, and therefore much less onerous than that undertaken by the Secretary of the Bureau in connection with the Bihar factories. And, for this purpose, besides the data collected on the spot, small sub-stations will be necessary, and their location will require careful consultation with the provincial Directors of Agriculture.

I have dealt with the improvement of the canes grown in some detail, because I am best acquainted with it; and it has always been my opinion that an officer, bearing in his hands a gift which every cultivator can at once appreciate, is placed in a very favourable position for the introduction of improvements in other directions; but the new kind of cane must be quite *obviously* better than that being grown, and its growth should, if possible, at first entail little alteration in the cultivator's time-honoured methods. Moreover, the greater yields obtained in the field will place him in a better position for outlays in other directions, when these are suggested to him.

I am aware that this point of view was somewhat sharply criticised in the Report of the Sugar Committee of 1920 (p. 300), as, indeed, were other points of procedure on the Cane Breeding Station. With regard to this matter, which naturally caused me some pain at the time, I would refer the Commission to the Report drawn up by the Sugar Committee of the Board of Agriculture at Bangalore in 1924. In this latter Report, the adverse criticisms passed by the Indian Sugar Committee were considered, and were practically all of them unanimously negatived. Those points, in which the Bangalore Committee agreed with the Indian Sugar Committee, had been strongly pressed by the Sugar Cane Expert from the first, with the single exception of extending the work into the new sphere of also raising seedlings for the tropical parts of India; there is, in my opinion, already far more work than he can get through. It is, in conclusion, important to emphasise that this reversal of the Indian Committee's findings was in no sense a factious proceeding. It was the matured opinion of those in the department who were present who had studied Indian sugar-cane problems for many years—and the Chairman of the Sugar sub-Committee at Bangalore was also the Chairman of the Indian Sugar Committee.

Dr. C. A. Barber.

But, although I consider the spreading abroad of the improved kinds of cane of such immediate importance, I wish it to be clearly understood that this is, to my mind, merely the first "project" with which the central office should deal. Equally important are improvements in the preparation of the raw juice. It is I think obvious that this does not mean any approach to white sugar making. The Indian raw sugar is eminently suited to the food requirements of the people: it has more flavour, is sweeter and, from the presence in it of vitamins, is probably a better food than white sugar. But the present methods entail a very great loss in most places during the process of manufacture.

So also the cultivation of the soil and regulation of water supplies, and the study and control of the numerous pests and diseases in the cane fields. And I would suggest that the Government should enlist as a start the following whole-time officers: Botanist, agriculturist, chemist, engineer, besides the two already at work. A separate mycologist and entomologist may very probably be unnecessary *at first*, if an arrangement can be made with the Imperial officers to add senior assistants to deal exclusively with the sugar cane. An increasing amount of attention is being paid the world over to pests and diseases of the sugar cane, as causing a constant and sometimes unrealised drain of the crop; and the unsuspected appearance of mosaic disease throughout India, only recently officially demonstrated, adds point to the enlistment of such officers. The importance of raising healthy cane plants is so great that I regard the arrangement suggested as likely to prove a temporary measure; but both the Imperial officers mentioned, and their predecessors, have devoted a good deal of attention in the past to the sugar cane.

I think that there should be a special publicity officer attached to the central office (whether it is called the Sugar Bureau or the Central Research Institute is immaterial, but I shall use the term Bureau in future, as that already exists). It will be recognised that this work requires somewhat different qualifications from those of the other officers mentioned; and I have no better suggestion to make than that the present Secretary should be placed in charge of the work of propaganda.

There is an abundance of work awaiting each of the members of the Bureau mentioned in my list, and I presume that it is unnecessary to develop that on which the engineer, agriculturist and chemist should engage themselves. These officers will at first be largely occupied in their respective surveys of cane-growing tracts (and the first named might profitably include the study of sub-soil water where this appears to be advisable), and they will be greatly assisted in many places by the information already accumulated. The distinct danger of having too many projects on at once will thus be avoided. The chief campaign of each year would presumably be decided at a united meeting of the officers of the Bureau, with the Agricultural Adviser in the chair.

I now proceed to develop my idea of the work which would fall to the lot of the botanist, and this somewhat fully, because of the importance which I attach to his addition to the staff of the Bureau.

The indigenous canes of India are practically peculiar to that country; although a few of them appear to have spread eastward and, probably within historic times, to China. Nowhere else is there such a wealth of different forms established. The study of these has been attempted at various times, but chiefly by provincial officers interested in those locally grown; and the work of Hadi on the canes of the United Provinces, and Woodhouse of those in Bihar were perhaps the most useful within recent times. I would like here to draw attention to the importance of the "pure line" method adopted by the latter in his collection of varieties, that is, the canes of each variety raised entirely from a single specimen—a matter requiring a good deal of preliminary study.

When the Cane Breeding Station was started, however, it was at once felt that a much wider and more scientific study would be necessary, and this was one of the first pieces of work attempted. A careful study was made of the canes met with in the Punjab, and afterwards a rough classification was prepared for such canes as had been got together at Coimbatore. A somewhat close study was then made of the distinguishing characters observable in a crop always reproduced vegetatively, and this was applied in a much more detailed study of two closely allied groups, which from their differing economic characters it was necessary to separate. The results of these studies have, to a certain extent, been published in a series of Memoirs of the Agricultural Department.

But it must be recognised that these pieces of work are the mere commencement of a much larger one; and were designed rather to show the way in which I thought that the classification should be approached, than as completed contributions to this end. And, possibly, it is because of the obvious magnitude of the task set that it has, apparently, been given up. The continuation of this work needs a full-time and properly trained botanist. The indigenous canes of India constitute the fundamental capital of the industry, and any effort at improvement will be assisted by a thorough knowledge of their character and capabilities. They are, after all, the raw material from which new and better kinds have to be evolved, and many of them, which are comparatively worthless to all appearance from the crop point of view, contain certain highly valuable properties, which might be extracted and implanted in the new seedlings.

And, besides their botanical affinities, endless questions as to agricultural and chemical characteristics and their relative resistance to disease require investigation, and should be studied hand in hand with the purely botanical study.

Much the same may be said regarding the tropical canes which have, from time to time, been introduced into the country; they are dotted all over India, and in many cases all trace of their origin has been lost. The problem to be solved here is in a way a much more difficult one, in that all of these canes are being or have been grown in other parts of the world, and it is desirable to know where this is. Their true names have been largely lost but, if these could be discovered, a great mass of information would be thrown open as to their real agricultural and chemical properties. Unfortunately, there is some ground for supposing that many have, with time, changed their character. We have numerous examples of such changes actually taking place; in fact, it is recognised that even a change from one part of India to another may cause the suppression of good characters for a number of years. Two recent cases may be quoted of this phenomenon: B 208 rarely grows properly in India, but some excellent examples were noted by the writer in Sindewahi in the Central Provinces, where the canes were long jointed and typical; and more recently Badila, one of the best kinds discovered in New Guinea, refused to show its true character for the first three years after its introduction into India. A full study of this effect of acclimatisation in the canes will be of great importance in the introduction of thick canes for the improvement of the varieties grown in tropical India.

The whole series of so-called " Mauritius " canes should be properly named. This was attempted by the writer some years ago, by sending descriptions of them to that country, as well as paintings and actual specimens. The answer was received, but this was while he was out of the country, and when he returned all trace of it had been lost (about 1908). The " Bombay " cane which succeeded so well in Bengal was only more recently found by him to be the well-known Tanna of Mauritius: Red Mauritius, Striped Mauritius, Purple Mauritius, White Mauritius, and so on, names given to the canes

Dr. C. A. Barber.

rescued from a private garden (with the exception of the first) and planted at Samalkota, require identification; so also "Java," an excellent type from Bangalore, and doubtless many others, some of which have been so long in the country that even their date of entry is unknown.

Then the time has come when, to avoid errors (and some appear to have been made already), accurate descriptions, according to the newer methods now employed in almost all cane-growing countries, should be prepared for all canes, whether seedlings or not, which are spreading over the country. I understand that this is contemplated at the Cane Breeding Station, and its importance in such a country of small holders as India cannot be sufficiently stressed; this would automatically fall into the hands of the proposed botanist. Among other items of equipment, it would be of great advantage if he possessed a knowledge of the difficult subject of cytology, which is being increasingly used in difficult classification studies.

These, and other questions connected with the internal organization and nutrition of the cane plant in India, would supply more than abundant material for the employment of a full time botanist as an officer of the Sugar Bureau. I may add that, since writing the above, I have been assured that this need is fully recognized by the white sugar industry in India; and I have been given to understand that they consider the proper investigation of the native races of Indian canes of such importance that, if land were wanted for a farm with this object in view, 30-40 acres of suitable sugar land would be willingly placed at the disposal of the Sugar Bureau. I would, further, press for this appointment to be made, irrespective of other proposals, as the matter is urgent, and valuable time will be lost if the work is not undertaken at the earliest possible moment.

II. The Cane Breeding Station at Coimbatore.

I feel a certain amount of diffidence in discussing the work being done on this Station, for obvious reasons. There are certain points which may, however, be touched upon, as possibly of use as to the line of study being pursued.

Tracing the course of events, the Station set out to explore an entirely new field, in dealing with the indigenous canes of India, and the possibility of raising seedlings from them. And it may at once be stated that, this being so, practically no assistance was sought or obtained, in the prosecution of the work, from any other country where cane seedlings were being or had been raised from tropical cane varieties. The problem set was a simple and very definite one, one might say a humble one, namely, to improve the very inferior kinds of cane grown in North India, where experience had shown that the introduction of tropical canes was out of the question. And yet its complexity turned out to be really far greater than in any other cane-growing country, for the simple reason that the numerous classes of cane found in different parts of the country differed more among themselves than do the whole of the tropical canes. There were thus a whole series of problems which presented themselves for solution; the type of cane likely to be useful in the Punjab is a very different one from that in Bihar, and each tract has to be separately studied and provided for.

The main results may be summarized as follows:—

(1) The demonstration that the seed of these canes, thought to be infertile from previous failures, is often highly fertile; and the explanation of the cause of these failures.

(2) The successful crossing of the indigenous canes with tropical ones, and both of these with various wild Saccharums. In all probability the success of some of the seedlings raised has been due, not only to the wild blood

infused, but also to the fact that the tropical parents used had been acclimatized for a very long time in the country; for a somewhat similar experience has been met with in cotton crossing.

(3) The controlling of cane arrowing. Many canes at first refused to flower on the Station, but were induced to do so by altering their time of planting, and especially their environment as regards moisture. Others never known to flower in India did so when brought down to Coimbatore; and in the last few years one class of canes of this description is said to have produced seedlings "of an entirely new form."

(4) Developing the technique of raising cane seedlings. This is constantly being improved, and is nowhere better understood.

(5) Seedlings have been produced which are rapidly replacing indigenous Indian canes in certain localities.

(6) The foundations have been laid for a thorough study of the morphology and classification of Indian cane varieties, and this study has thrown a good deal of light on the relations existing between Indian and tropical canes, and also on the way in which all sugar canes grow.

But in spite of this successful work accomplished, it is somewhat disconcerting to note from the published reports that, of the seedlings selected after exhaustive local trials to replace North Indian varieties, those first sent out in 1918 still appear practically to hold the field. This may be a fortuitous circumstance, and it is devoutly to be hoped that it is, and that new and better kinds will soon follow. In 1918 it was confidently expected that each year better and better seedlings would be sent north for trial, and that those first let loose would soon be replaced. The matter should be somewhat carefully investigated.

In the earlier years it was natural that, once it was demonstrated that seedlings could be raised, one felt some pride in the numbers produced, in the number of crossings effected, and in the numbers of seedlings grown to maturity and tested as to their sucrose content. This extensive work was necessary in order to gain an insight into the reactions of entirely new forms of sugar cane to hybridization. For there is little doubt that the indigenous Indian canes belong to a different species, if not to a set of different species, from those in the tropics.

But once this mass of hybrids had been raised and their characters investigated, it would seem more fitting that the numbers dealt with in each year should gradually decline in all directions, with a proportionate improvement in the economic results obtained. Otherwise the work might be likened to a ottery, with a more or less unlimited number of tickets, but a strictly limited number of prize winners. The object to be aimed at should be the elimination of the lottery aspect as soon as possible, and gradually to raise the proportion of winners till the enterprise becomes a profitable investment. And it is to be remembered that, if this can be done, the excessive labour connected with raising and testing multitudes of cane seedlings will, concurrently, be very greatly reduced.

I would suggest that each year's programme of crossing at the Station be raised to the status of a major "project"; and that, as every member of the proposed Bureau has a vital interest in the results, this programme should be submitted to the Agricultural Adviser, and discussed by the whole body of members of the Bureau, before being carried out (allowing, of course, for seasonal difficulties in the flowering). Useful suggestions might doubtless be made and, at any rate, the onus of any lack of success would not be borne, as it is, by the hardworking officer in charge of the Station.

Presumably, accurate records are maintained in the office of the Sugar Cane Expert of the actual crossings attempted and effected year by year,

as well as the results obtained, but little is known on this important matter, and I think that some form of publication should be adopted. A start was made in 1916, when the seedlings obtained during the first five years were dealt with (Memoirs of the Dept. Agr. India, Botanical Series, VII, 3, pp. 109-130), but nothing further has been attempted. It seems to me that such brief historical accounts of the course of development in the work of the Station, and especially the enumeration of the exact parentage of the seedlings raised, are an important duty of the officer in charge. The form in which the pages referred to above are presented is entirely unsuited to the typical Annual Report. But, taking the public into his confidence, and possibly interesting them in the work of the Station, appears to me to be the best form which the officer in charge can adopt for advertising his section. The desire to do this latter is, perhaps, a little too evident in the Annual Reports, and this suggestion will enable him to get out of the difficulty that he has no other means of advertisement.

If this historical account is undertaken, it will at once be studied by all interested in growing the new seedlings, for all necessary details would be added, as to change of numbers by which the seedlings are known on the farm, to those attached to them when given out for trial. It is not very easy to hold in one's memory the salient facts concerning the origin of these seedlings. And such a record would, moreover, be of the greatest advantage in preparing each annual campaign for crossing, both for the officer preparing it and for all interested in the matter—planters, the more intelligent cultivators, and the officers of the Bureau.

There is a very marked difference in the scope of the scientific studies of the present and the previous officer in charge of the Station, and I wish to say a few words on this subject. I consider that this is as it should be; for I have always held that it is, in most cases, quite unreasonable in scientific work to expect any man to carry on and develop the line of work started by another. Differences of experience, equipment and outlook must be allowed for, and, more important still, the type of the investigator's mind must be considered. And I have no fault to find, on this account, with the sudden cessation of the morphological and systematic studies which I was able to commence during my tenure of office. I fully recognised all along that the present incumbent was rather a physiologist than a morphologist.

But, all the same, I am fully convinced of the importance of a much more thorough study of the indigenous Indian canes, both in the collection and in their natural habit, than has yet been possible. As mentioned elsewhere, I consider that a well-trained botanist should take this matter in hand, and that the officer in charge of the Cane Breeding Station should be relieved of it.

I am also convinced that the raising of seedlings for North India is a full-time job, and I do not think that it will be profitable to saddle the officer engaged in this work with the widely differing problems of the improvement of the tropical canes grown in India. It is to be remembered that a great deal of touring is necessary to gain a knowledge of the various tracts, for which new forms are needed, to replace the indigenous canes of India and, roughly speaking, the two kinds of cane are not important in the same parts of the country.

But it is only right that I should mention that the Indian Sugar Committee, in their Report, do not appear to think that the Sugar Cane Expert has enough to do, and they propose that additional burdens should be laid upon him, although their proposals have been very considerably modified by the Bangalore Meeting of Indian agriculturists. The Sugar Committee

proposed that he should carry on the work on the same lines as before, and specifically mention the classification of Indian canes. They add that breeding work should also be done on the thick tropical kinds, for the benefit of such places as grow them. Then, the same officer should inaugurate a Sugar Research Station for South India, without specifying its work; he should open a second Breeding Station in the Chittoor district of Madras, as the Committee has convinced itself that canes which do not flower at Coimbatore might do so there; lastly, the important problem of the duty of water for the sugar cane in India should seriously engage his attention (this is no small piece of work, and would of course involve a series of irrigation stations all over the sugar tracts).

I must confess that I am not in sympathy with the part of the Indian Sugar Committee's Report dealing with South India, including the Cane Breeding Station; but I should be very sorry to give the impression, which might be conveyed, that I extend this disagreement to other parts of their Report. As a matter of fact, I consider it a mine of information regarding the Sugar Industry in India, and constantly refer to it as my authority in all cases where I have not a personal knowledge of the subject. No other document of anything like its value has thus far been produced, and it is not likely that any other will appear for many years to come.

On interesting the Civil Service in the Agricultural Department.

With some hesitation, I append a note for the perusal of the Members of the Commission on a subject which I think is closely connected with the well-being of the Indian Agricultural Department; and that is the advantage which would accrue both to the Civil Service and the Agricultural if some form of liaison were formed between the two at the earliest possible moment in the training of the former. I do not know if any steps are taken in this direction after the probationers reach India, but believe that there may be: what I would propose is a somewhat more general treatment of the subject than would be obtainable once they were placed in their respective Provinces.

My attention was first drawn in this country to this subject when, some years ago, I was asked by the probationers here to give them an informal account of Agriculture in India. These were chiefly Indian at the time, and I was surprised to find how little they knew of their own country, and especially of its staple industry. Their interest was, however, very encouraging.

I accordingly wrote to the India Office suggesting that a course of six lectures might, with advantage, be given to each year's probationers, on the physical geography and climate of India, and its influence on the crops grown in different parts. I received a courteous reply, referring me to the local Board of Studies who had the training under their control. Here, too, I received a courteous reply; but in both cases it was very distinctly laid down that there "was no money available" for such a course of lectures. The matter then dropped.

My attention has again, very recently, been drawn to this subject, by the decision of the Colonial Office to transfer much of the preliminary training of their probationers from London to Oxford and Cambridge; and I was approached as to whether I would give a term's lectures on "Tropical Vegetable Products." About 40 men formed the class, and I prefaced the series by six lectures on the physiography of Africa (as they were all designated for that country) as related to its productivity. I have never had a better or more attentive class. They were drawn from all sources

and varied enormously in their previous training; the subject was new to all and a number had never attended a course of lectures before: but in the examination held at the end of the term there was only one failure.

I do not propose that the Colonial Office's example should be altogether followed, but it seems to me that, for revenue officers, some knowledge of the possibilities of improving the conditions of the people would be of great interest throughout their probationary course of studies.

Oral Evidence.

58,270. *The Chairman*: Dr. Barber, will you please tell the Commission exactly what post you hold at the School of Agriculture, Cambridge?—I am Lecturer on Tropical Agriculture. It is not a University appointment. It is one of the extra lectureships in the hands of the Professors.

58,271. Would you give us a brief account of the nature of your appointments in India?—I went out as Government Botanist to Madras and I remained Government Botanist up to 1912. Although I went out in connection with the Botanical Survey of the South of India from Bombay down to Travancore, and including all Native States, I was put on to agricultural work within the first two months of my arrival. I carried on dual duties for a number of years, until ultimately I was able to place an Assistant in charge of the Survey. Then, when the Agricultural College was started at Coimbatore about 1908, I was attached to it and lectured there for a few years. I was appointed Sugarcane Expert for India in 1912, and I continued in that post for the rest of my service. I retired in 1919.

58,272. *Sir James MacKenna*: With regard to the Coimbatore station, have you been following the work at all since you left it?—I have not been able to follow the details. For a time there were no reports printed, I believe, and even then the reports were provincial ones and were cut down very severely, so that one did not get to know too much from them.

58,273. You are not in a position to say whether the work has progressed?—I cannot say much about the work. Incidentally I hear that it is going on. Every now and then a small paper appears in the Agricultural Journal of India, shewing progress along certain lines; but I cannot give a proper statement as to the main lines on which the seedlings are being raised.

58,274. Had you formed, before you left India, any idea of the establishment necessary to carry out the full programme of work at Coimbatore? You were single-handed all the time you were there?—Yes.

58,275. Apart from any staff attached to the Bureau, what views have you about the extension of the staff of Coimbatore?—I was fully employed with what I was doing, and I could do it. My only difficulty was in testing the canes in other parts of India for which I was raising and testing seedlings. I thought I should have an assistant in charge of certain stations in the North.

58,276. That is, separate stations under the Cane Sugar Expert?—Yes.

58,277. Under Imperial control?—Yes.

58,278. Did you arrive at that opinion on account of the difficulties that were encountered with provincial Directors in getting facilities?—Generally speaking there was no difficulty. There was only one case where there was any difficulty. It was not because of that so much as because of knowledge that we required ourselves. The conditions at Coimbatore were not adequate, although I chose the situation specially for the North of India; that is, not on the wet paddy land, but on garden land, light soil under wells, of a somewhat similar character to that in North India. But the difference in climate was so great from that of the Gangetic plain, that we really wanted another station up there.

58,279. It was your idea to have one in the United Provinces?—Not especially; there would be several wanted in various parts; for instance, Bihar is very different from the Punjab.

58,280. Together with out stations under provincial control?—Yes.

58,281. Rather than having provincial stations?—At that stage it was necessary to have our own stations.

58,282. Would Karnal be a suitable situation?—I do not know Karnal. That is moderately close to Delhi. I do not know the sugarcane in that tract except that there is a good deal about it which seems to assimilate to the neighbouring part of the United Provinces tract, which is good.

58,283. Do you think the Coimbatore station can be run by one man, apart from this travelling inspector, or would you not strengthen the staff at Coimbatore a little, assuming the question of thick canes was being tackled?—I do not think one man can do both the thick canes and the thin canes properly.

58,284. What is your view about the thick cane work? Is Coimbatore the best site for that, or would you choose another?—I would rather be inclined to choose Bangalore for thick canes. The growth of the thick canes and their juice at Bangalore are extremely good.

58,285. Do you think that the work on the thick cane is a matter for Imperial guidance or can it be done by the Provinces?—I do not know that it is so important from the Imperial point of view, unless the Bihar planters or the Bombay planters can utilise them. For the people themselves, I do not think thick canes are so important, except in South India, the area in which is very small compared to the total area under cane in India.

58,286. That is a matter that could be possibly left to Provincial control?—The only difficulty is that there are small areas of thick cane in so many Provinces. You have it right up into the North-West Provinces, and you have it right up in Assam, and scattered over almost the whole of India.

58,287. *Sir Henry Lawrence*: Do you regard the Poona cane as good?—Poona cane is extremely good for Poona with its porous volcanic soil; but it is absolutely hopeless elsewhere. We had a truck load planted in the Godavari delta, and we could not reap enough sets to replant the crop. It was absolutely hopeless in the Godavari delta. It was experimentally grown there; but whenever you put it under good irrigation on heavy soil, it becomes diseased at once.

58,288. *Sir James MacKenna*: Is your idea that the work in connection with sugar development, other than the plant-breeding work going on at Coimbatore, should be under the control of the Sugar Bureau?—Yes.

58,289. With the Secretary as the executive officer?—No.

58,290. Who would be in charge of the whole operations: an agriculturist?—I think an agriculturist would be preferable, if one could get a suitable one; but for the time being a Civil Servant would probably be the best until the work has got into order. That is judging from my experience of similar cases in India while I was there.

58,291. What functions would you assign to this Bureau, apart from the accumulation of information?—There would be thee information to be got together, getting to know all about the plant, which means not only testing the way to grow it, and the different varieties, and so on, but even the whole of the local trade. Then there would be questions of engineering connected with sub-soil water and irrigation and the question of manure. When that is all got together, I would start very much on the United States plan of having definite "projects," as they call them, a series of schemes as to improvements in certain localities, whether in making *gur*, or in the introduction of some new kind of cane, or matters of improving the cultivation, or the sub-soil water supplies, or whatever the point might be. I think I have explained my view fairly clearly in the note.

Dr. C. A. Barber.

58,292. I suppose you would give this Bureau a farm?—Yes, there would be a farm, I suppose, but it would depend on what they wanted. I should have one connected with the Institute. They would be sure to want a farm for some purpose or other.

58,293. Have you any ideas of what the location might be?—I did not form any definite idea on that.

58,294. It would be Northern India I suppose?—Yes, or close to Northern India. I am not quite sure that some place like Jubbulpore would not be a good one; but I have not really thought that out. The locality would be best determined in India.

58,295. What would the position of the Bureau be with reference to the station at Coimbatore?—The Coimbatore station would be one of its branches. It would be an important section, but it would be only one section. There would be a series of different sections.

58,296. Assuming that the Bureau were created, would it be an advantage that it should have similar directive power over other existing big sugar stations?—I should not think of interfering with any provincial stations. Let them go on with their work and let the Bureau help them, and take advantage of their work as much as possible.

58,297. Do you think that sugar should be tackled as an All-India problem?—Certainly. I have pointed out that there is a great deal of improvement taking place all over the country, but it is excessively slow. There are so many things that everybody agrees that the sugarcane industry wants that I think there ought to be a fresh start, and it ought to be taken as an Imperial project.

58,298. So far we have got the Bureau, Coimbatore Station, and possibly the Northern Indian station. Would it have any other function beyond that?—I do not quite understand you.

58,299. Beyond the control of those three stations, what duty would you assign to the Bureau?—There would be touring throughout the length and breadth of the country.

58,300. Getting in touch with provincial officers?—The agricultural and engineering and other officers who are collecting information. There would be a thorough examination of the whole of India, wherever the sugar industry is of sufficient importance. That would be the main work at first: the collection of this material in a central building.

58,301. So that the Bureau could give authoritative information on any question which arise?—There should not be a question of any kind which the Bureau should not be able to answer.

58,302. You intend no interference with the provincial work?—None at all.

58,303. The information is there, and the Provinces could have it, if they liked to ask for it?—Some of them would very likely throw their work into the hands of the Bureau; but it would be rather an advantage if they did not, because they would be working in separate lines and adding to the information.

58,304. Without any reflection on the qualifications of Mr. Venkatraman, with whose work we are very pleased, do you think that was the best appointment that could have been made when you left?—It was the best appointment possible in the circumstances.

58,305. At the end of the War?—They could not have got anybody else. Another appointment made, and that would have been a thoroughly good appointment, but the Province concerned rose up in arms.

58,306. They would not give the man up?—No; and they were quite justified in that. They had been giving men up for a series of years.

58,307. Knowing Mr. Venkatraman as you do, do you think it would be an advantage if he could have a year's training at Cambridge in plant

genetics? He has been practically trained by you, I think?—By himself very largely, administratively by me. A year would not be sufficient, in my opinion.

58,308. He is a bit too old to give him more?—You cannot do anything in a year, especially on a subject like genetics.

58,309. Would it be worth while giving him training at Cambridge at all, considering his age?—I think it is rather too late now.

58,310. *Professor Gangulee*: Your first suggestion is to carry out a detailed survey of the whole position, and I understand that that detailed survey is to be carried on by a central agency?—Yes.

58,311. The next point you emphasise is that there should be a properly equipped central research institution for conducting investigations of fundamental importance?—Yes.

58,312. Do you consider that cane-breeding work and other investigations in relation to cane production are of sufficient importance to justify a central research station solely for that purpose?—I should say certainly.

58,313. You would have a central institution properly equipped, and you would have a number of sub-stations under the control and supervision of the central institution?—Wherever necessary.

58,314. Are these sub-stations going to be staffed and financed by the central agency?—Entirely under the central agency.

58,315. What would the relation of those sub-stations with the Provinces where the sub-stations were located?—There would be no actual relationship with the Province, but they should not be made, as a rule, without consultation with the local departments, and they should work in liaison with them.

58,316. In this properly equipped central institution you would have plant-breeding work, and also soil investigation connected with it?—Everything.

58,317. Also plant pests and diseases affecting cane?—Yes.

58,318. Thus, you would have all the factors concerning cane production dealt with in the central institution?—Yes, the whole thing.

58,319. Would you include the industrial aspects of the problem?—I should think probably the industrial aspects would not be required at first. There might be instances where that part of the question would be helped, but I do not consider it necessary to put in an Economist at present.

58,320. How would you compose the governing body of such a properly equipped central station?—I should not call it a governing body. There would be a Director, I presume, and there would be heads of sections. They would have meetings together, to decide any points that arose.

58,321. You will have provincial representation in this governing body?—No special provincial representation. These men would come from all the Provinces, and I should say it is an Imperial thing for all India. No particular Province would have any special place there, so far as I can see.

58,322. How would you interest the Provinces in this central institution?—I do not think it would be necessary to interest them. If they grow cane to a sufficient quantity I think they would be interested naturally. I do not think any steps would be necessary to interest them. The officers on tour in the Provinces would not be able to do that without consulting the authorities, and they would be guided as to particular wants, and so on. A great deal of help would be given by the Provinces in this work. It is for their good. I do not think it would be necessary to try and interest them in any way.

58,323. On what principle would you carry out what you describe as "a series of projects"? Is it your idea to allocate different projects to sub-stations?—No, not at all. The projects would be the major work of the year. One or two things would be decided on, which would require to be done. For instance, one of those things is the cane breeding. That is the

major project. There would be other projects as the investigation proceeded. These projects would be carried out by the central agency by sending its men out to the particular place where the work had to be done. It is all an elastic thing. It may be one single item in cane growing or it may be a study of a particular part of the country.

58,324. Supposing you want to study certain varieties of cane in the United Provinces, you would send your man from the central station there?—The proposed Botanist would do that. That would be his work.

58,325. On the point of raising seedlings, and the Java method of short planting for rapid multiplication of cuttings: that particular method has not been attempted in India up to now. Can you tell us what the difficulties are?—The chief difficulty is that it is not at all suited to North India because of cold; whereas it is a well-known custom, and has been for perhaps hundreds of years carried on in the Northern part of Madras Presidency. There a six-months' crop for providing cuttings is regularly grown, what they call *gonda manchi* in Ganjam. So far as I can see there is no object in attempting to introduce the Java method into North India for the simple reason that the cold season is a bar.

58,326. Do you hold out any prospect of success in introducing the method of short planting?—Not the method of planting. That is quite a different thing. That has been tried, and it is extremely costly, requiring an enormous amount of hand labour. It could not be undertaken in India because the cost would be too great.

58,327. There is the one-bud system of planting sugar cane, as practised in Cuba; do you see any prospects for that?—I do not see any advantage in it. So far as I can make out, there would be no diminution of, but rather an increase in, labour. It would also tend to limit the crop to make one-bud sets rather than the ordinary three-budded sets, as there would be one-third chance of obtaining germinating shoots. I do not think it is ordinary Cuba practice.

58,328. You spoke of an interesting experience of the success you had in convincing the cultivators of the efficacy of your canes. For the right kind of propaganda, do you think it is necessary to have demonstration farms, or to demonstrate on the cultivator's own farms?—They are, all of them, useful. There is the demonstrator who can go about with a piece of cane; there is the demonstrator who wants to show how to grow cane, and there is the demonstrator who requires a large area so as to grow it on a crop scale. One will merely distribute the pieces of cane, another will require a small demonstration plot, and the last-named will require large areas over which he has some control. There are all stages. All of these methods are used throughout India.

58,329. Your success arose from the fact that you took the canes and placed them in the hands of the cultivators, giving them an opportunity to grow those canes on their own fields?—That is just that one case of success. There have been other successes, of course.

58,330. *Sir Henry Lawrence*: I want to ask you one or two questions on the economics of cane apart from growing it. Do you regard the future of the sugar industry in India as of very considerable importance?—Do you mean white sugar, or the whole thing?

58,331. The whole thing combined together?—I think the whole industry extremely important, because of sugar being such an important article of food of the people.

58,332. Do you think there is a good prospect for improvement?—Yes, I am quite certain of it.

58,333. Any improvement of the cane will react on the refining factories for white sugar?—Among other things, the improvement of the cane would get more food for the people. That is the first thing. That is the basal factor. At present they do not get nearly enough out of the land With a better cane which can stand the conditions under which cane is grown in India, and which are practically unique, they can double the yield.

58,334. A good deal of sugar produced in India is used for sweetmeat consumption by the people?—Yes, the white sugar.

58,335. Is white sugar or *gur* the best for making sweetmeats?—I believe white sugar is very much better for making sweetmeats than *gur*.

58,336. Are you acquainted with the white sugar refining developments in the fields in the Western United Provinces: not the factories, but the installations set up by the zamindars?—I have not seen much of that. During most of my time in India I remained in Madras. It was only during the last seven years that I was in the North. I got then into the Western part of the United Provinces, but that was all; and I have not come across that development.

58,337. Have you ever considered the question of the importation of sugar from abroad, particularly from Java? Do you consider that is any danger to the sugar industry of India?—I must say that I was greatly impressed by the enormous amounts of sugar coming into India, first of all from Austria, and then from Mauritius, and now from Java. It seems to me absurd that a country growing as many acres of cane as practically the rest of the world put together should not be able to make the small amount of white sugar which is required by the inhabitants. A very great deal of money goes out of the country in buying that sugar. One of the aims that I had at the back of my mind, a subsidiary proposition, when I started trying to improve the sugar canes in India, was that we should be able to make this sugar ourselves. There is no reason, that I can see, why India should not be self-supporting with regard to white sugar as well as with regard to *gur*.

58,338. So far, the pioneer work in this industry has been done by foreign capital. Do you see any opening for the employment of Indian capital and Indian officials at the different factories of the companies?—Well, my views on that point are that the present white sugar makers are the pioneers, and that there is a very great scope for the extension of white sugar making in India, if these new canes succeed, as I expect they will do. The great bulk of that extension will not be by the employment of European capital. They are simply the pioneers. I am looking to the time when practically the whole of the white sugar industry, or the greater part of it, will be engineered and capitalised by the Indians themselves.

58,339. Therefore involving the employment of scientific and mechanical experts of Indian birth?—A very large proportion will be needed. The bulk of the employees in the higher grades will be Indians, and increasingly so as they get trained. They will have to get expert engineers and so on in the first instance from Cuba or the United States or Mauritius; but afterwards I look to the time when that work will be in the hands of the Indian engineers trained in the country. At any rates, a great many subordinates would be so utilised. Then there would be the whole growing of the cane, and all plantation work, which should be entirely in the hands of the cultivators.

58,340. Holding those views, do you consider that the sugarcane industry should receive protection by the Government? At present, as perhaps you know, there is a duty which affords protection: but that is imposed for the purpose of revenue, and, therefore, is liable to be altered purely on revenue considerations. Do you consider that that duty should be recognised by the Government as a protective duty in the interests of the whole sugar industry of India?—Well, I must say that I have always regarded that this way of putting it, to the plain man, as something like juggling with words. It is obviously protective, although that may not be the intention. Without that protection the whole of the white sugar industry of India would go out. Everywhere else in the world, perhaps with the exception of Java (Java is so highly organised) financial considerations have to be brought in. In the whole of the United States market it is treated as a matter of finance. They would not be able to grow the canes, and they

would not be able to produce sugar, unless they were protected by their great open market at home. Mauritius has not much protection. It has a beautiful soil and excellent cultivation. The South African Union, Australia and the United States, could not stand to-day without the protection that they have; it is a protection to an enormous extent; and the same remark applies to India. They would not be able, with their present factories and classes of cane, to withstand the competition from outside, from Cuba, Java, Mauritius and so on. I think the white sugar industry of sufficient importance to be protected in India. It is simply following the universal rule throughout the world. The Java sugar industry, which is not protected, so far as I know, in any way financially, has an insurance in the shape of spending £100,000 a year in scientific work for the improvement of the sugar industry alone, which the sugar makers themselves subscribe and spend. India cannot hope to stand against competition of that kind, let alone the fact that the factories are small although they are very good as compared with what they were twenty years ago, and the canes are very poor. The climate over a great part of India is entirely unsuited to tropical canes, and always will be. The greater portion of the Indian sugar industry is outside the Tropics, and in a cold climate, which is more suited to growing the crops of cold latitudes during half the year than those from the Tropics. I am very strongly of opinion that the industry is one of very great importance, and should have protection.

58,341. Do you know what is the extent of the protection given in South Africa? Does it exceed fifty per cent. of the cost of importation?—I cannot tell you exactly, but it is worked out in this way: that the sugar shall be sold at such and such a sum in the markets of South Africa; I think it is about 3½d. a lb. It is something like 4d. in Queensland and in the Australian Commonwealth. If sugar is sold at that price, then it enables the Government to allocate so much to the factory, and so much to the plantation; and that is the form of protection. Other sugars attempting to enter are taxed according to that basal principle of giving good, cheap sugar to the populace.

58,342. *Sir Thomas Middleton*: You have paid special attention to the botanical character of sugarcane?—Yes.

58,343. Is it your opinion that the many varieties which we meet with in commerce have originated independently and represent different stocks? Are we dealing with one cultivated species which has been produced from one species of wild parent, or are we dealing with several?—We are dealing with several; but the great mass of canes in the Tropics (and that is, where we get our white sugar from) I believe arise from one species, the species classed as *Saccharum officinarum*.

58,344. Those are tropical canes. As to extra-tropical canes, have you any views as to how those might have originated?—I have studied these for years trying to find out; and my present opinion is, that considering the great number of wild *Saccharums*, as compared with other places where at most one is present, it is highly probable that the canes of North India have arisen from them; but there are a great number of varieties. There are several wild *Saccharums* in North India; and I consider that the canes of North India have probably been derived from a number of separate species. I have found the wild *kans* grass (*Saccharum spontaneum*), which generally is as thin as a crowquill, thicker than almost any of the canes produced in North India, nearly an inch in diameter. I have also found variations among the wild forms, which would compare with the almost infinite variations among the cultivated forms. So that you may have a whole set of different species, all of them gradually developing into cultivated canes. Probably two or three of them have, with their variations, given rise to the great bulk of the present day Indian cultivated canes.

58,345. Then in the ordinary way, taking sugarcane as being vegetatively reproduced over a long period, do the types remain pretty uniform or do you notice variations due to cultivation?—The question of degeneration is a very long one.

58,346. I was not thinking now of degeneration. I am coming to that? —It has been treated rather in the same way.

58,347. In the parallel case of potatoes, where we have degeneration after cultivation, there are some physiologists who hold that it is a question of disease?—Yes.

58,348. In sugarcane, is there any indication of deterioration, as distinct from the effect of disease?—Certainly; but that deterioration is more and more held to be due to the fact that the cultivation is intensive, manuring and massing together, and irrigation. All these things are contrary to nature. The plant is becoming weakened, therefore diseases appear Diseases do not cause the deterioration. One of the most important things is this, that the virgin soil in the Tropics has been used up. The soil that never had grown cultivated plants produced enormous crops, and that is where we used to grow our sugarcane, but that has all been used up. The soil has deteriorated to an enormous extent in the Tropics by constant cultivation, forcing crops out of the ground without sufficient manurial replacement. We are planting old established kinds which have not altered on this inferior land, and because they will not grow we say they have degenerated. I think probably the planting of cane on unsuitable land is more responsible for the idea of deterioration than anything else.

58,349. One does not find, given reasonably good cultivation, the rapid deterioration in the vegetatively reproduced sugarcane that one finds in the case of the potato?—The difficulty is that a number of diseases have appeared which are increasing in virulence, and they will attack the cane where they would not have done so before. Other canes in these tracts are diseased, and they hand their disease on. I will take as an example the old Bourbon cane which has been completely destroyed in almost all parts of the world, and which was grown almost universally fifty years ago and gave great crops. But I can give you a case where that cane is still growing perfectly successfully without any disease, and that is over the whole of Peru. But if you think of the nature of Peru, it is secluded, it is isolated. There is a great barrage of deserts all round it, and sugarcane is grown in some of the fifty-one valleys which are fed by mountain streams from the Andes, with natural irrigation. Those valleys have a light, alluvial soil that is constantly enriched, and you can see that the conditions are not comparable with the conditions over the rest of the world, where the virgin soil has been used up.

58,350. In the case of potatoes, we are forced to breed new varieties at rapid intervals because the old varieties quickly degenerate. In the case of sugarcane, is the problem as acute? Must you produce new varieties, or do the varieties which exist last for a long period?—They vary very greatly in that. Some of the new varieties, of the first ones produced, the oldest seedlings, are still going strong. Others last for two or three years and go out. It is largely a matter of the places in which they are planted. The tendency now is to develop a new seedling for a definite region. It is grown on an experimental station. The conditions of that experimental station are isolated perhaps. They are not the same as elsewhere. Consequently we are developing a series of seedling canes suited for certain conditions, it may be for one part of the country or it may be for only one station. While that cane does extremely well for the local purpose, as soon as ever you get it distributed over a wide region it rapidly becomes diseased and degenerate.

58,351. In your work at Coimbatore have Mendelian methods been applied? —We tried them, but one great difficulty was this: You want, in Mendelian

work, to have a series of generations one after the other. You grow your cane, you get your seedling, and you plant it, and you look for the seed, but there may not be any. I am not a Mendelist, but I know sufficient about it to be able to do some work on it; Mendelism was discovered after I left the University.

58,352. Obviously the possibilities are very much restricted by the failure of first crosses to set seed?—Very much restricted. I had two plots of a hundred seedling plants each of the same parentage, and there were no flowers among them.

58,353. Is it necessary to grow your seedling canes at Coimbatore, or can you send them out to the districts for which they are intended?—I should say that, after three or four years, outstanding seedlings could be chosen.

58,354. Can you, under the conditions existing at Coimbatore, select the varieties which are likely to suit distant places such as Lyallpur?—No.

58,355. Is it not desirable that canes from Coimbatore should go at once, or as quickly as possible, to the areas for which they are intended, so that they may be selected under the conditions in which they are to be grown?—That has been done; small seedlings have been sent, but I do not think there is much good in that. You would require really to have the whole staff of Coimbatore up at Lyallpur, and there are great difficulties in growing the seedlings to maturity in North India. They take 18 months from seed to mature cane and the winter would at once kill them.

58,356. The seedlings, not the seed?—I mean the seedlings when they are put out from year to year. There are great difficulties in growing these in North India, whereas the thing is perfectly clear at Coimbatore, and you can grow them right through. It would take three or four years before you could send canes out which are likely to be good and useful in certain places.

58,357. A large percentage of the canes you grow at this tropical station, are destined for sub-tropical cultivation?—That is one of the main difficulties of the work of raising them, as the canes do not flower properly outside the Tropics. The final selection has to be done afresh at Lyallpur and will probably take another three or four years.

58,358. You make the interesting suggestion at the end of your note that the knowledge of the members of the Indian Civil Service with regard to agriculture is susceptible of improvement?—Yes.

58,359. What was the difficulty that stopped your giving the proposed course of lectures at Cambridge? Was it the very small sum of money that was called for?—Apparently that was the thing. There was this idea, I think, with regard to the training of the Civil Servants in this country; it is purely a matter of expense. The India Office does not interfere with the training given locally. If Cambridge were paid to give a series of agricultural lectures on the subject, Oxford would have to be paid the same. They could not give money to Cambridge which was not given to Oxford.

58,360. *Mr. Noyce*: I should like to say, at the outset, Dr. Barber, that whatever criticism was passed by the Indian Sugar Committee on the work at Coimbatore, the last thing they wished to do was to minimise its value and importance. It was very unfortunate for the Sugar Committee that you were unable to be a member of it, and, as you know, we all felt that very keenly. I think the main point of difference between you and the Sugar Committee was in regard to the simultaneous introduction of improved canes and improved methods of cultivation. The Sugar Committee went a great deal further than you, in considering that it is no use introducing improved varieties without, at the same time, introducing improved methods of cultivation. In fact, they held it was most undesirable?—That has proved not to be the case, because the spreading

of these new seedlings has been begun without any difference in cultivation. In cases where they have succeeded, and they have succeeded enormously in some cases, there has been no change in cultivation.

58,361. Do not the agricultural departments, in those Provinces where those changes have been introduced and are now succeeding, endeavour to improve the cultivation?—They are always improving the cultivation by their slow methods. Improved cultivation and the introduction of improved implements are always spreading, but there is no necessity for the two to be bound up together with the introduction of fresh seedlings, as was done by the Sugar Committee. My opinion is that you have a gift in your hand which the cultivator can appreciate. He will be much more likely to adopt any suggestion you make with regard to the cultivation of the new good canes which you have given him than if you simply tell him that there is a new process of cultivation and show him the new method of cultivation. It is not easy for the cultivator to appreciate the difference as he would see it on the farms. He would say, "Yes, that is *sarkar* luck. It is something beyond experience." But give him a cane which gives him a better crop and then come along and say, "Look here, if you grow it in this way you will get more, and if you do not get rid of this disease you will get less," he is much more likely to listen to you; and that has proved to be the case.

58,362. That was the reason why the Board of Agriculture in 1924 disagreed with the Indian Sugar Committee?—Yes.

58,363. But is not there a danger that improved methods of cultivation may be neglected?—I do not think you can lay that to my charge.

58,364. No; but I was thinking that possibly the Agricultural Department might neglect it?—I think there is a distinct danger that the cultivator might; but he would be in a better position, with the doubling of his crop, to introduce improvements.

58,365. I want to make it clear that you agree with the Indian Sugar Committee to this extent, that you hold that improved methods of cultivation of your canes are very important?—Yes.

58,366. I wanted that on record?—That is quite true. I quite agree with that. I can also give one case where the introduction of a hardy cane which produces a very large tonnage has done very definite harm to agriculture and to cultivation, and that is the growth of the Uba cane in Natal. It is a North Indian cane misquoted under the name "Uba."

58,367. *Professor Gangulee*: It is immune from mosaic disease?—Yes. They have cultivated it with such ease that they have neglected all the cardinal principles of good cultivation. It is not the ignorant ryot who has done that, but it is the British planter. There is a danger of that kind.

58,368. *Mr. Noyce*: With regard to this question of improved methods of cultivation, what are your views in regard to other crops than cane? Do you consider the position there is the same and that you can give the cultivator an improved variety, which does not necessarily require the simultaneous introduction of improved methods of cultivation?—You can do it with other crops, certainly. I think they are on all fours, sugar and other crops. In some other crops the cultivation is done much more carefully than in sugar cane, such as betel pepper, which fetches a relatively high price.

58,369. With regard to the breeding of thick cane, which is another point on which the Sugar Committee laid some stress in regard to Coimbatore, do not you think that, as the money for the Sugar Cane Stations comes from the whole of India, those parts which grow thick cane are entitled to some share in the work? Although the area in Madras and Bombay is comparatively small, the out-turn makes up for that to some extent?—I do not mean to veto the work on the thick canes at all. My idea was

that it should not be undertaken by the man who had the vastly more important work of improving the thin canes. Another man should do it.

58,370. There, again, there is a certain amount of agreement between you and the Sugar Committee, that the work does not seem sufficiently important to justify an entirely separate station. Why could not you undertake it at Coimbatore, as the Board of Agriculture suggested, by increasing the area at Coimbatore and giving the Sugar Expert an assistant? What is the necessity for having two separate stations?—Personally, I should separate them entirely. I do not think that Coimbatore is the best place, for one thing, and the problems are so different throughout, besides which there are a vast number of improved thick canes which are developing elsewhere, which would certainly be worthy of trial. The introduction of canes, the acclimatisation of canes, and testing them, would be an important part of the work. I think there is quite enough work for one man.

58,371. If you are going to have a Sugar Cane Expert, is it not better to give him the whole work, with an assistant, even if you had two separate stations? Would not it be better to have the sugar-cane breeding under one man instead of two separate people dealing with thick and thin canes?—The actual breeding of sugar canes is the simplest thing in the world.

58,372. You would have a separate man in charge of the thick canes?—The work comes afterwards. You cannot shift the canes; you have to work where they grow.

58,373. What advantage do you gain by completely splitting up the work on the thin and the thick canes?—One reason may be that there would be a danger of the thick cane taking more of the energies than its one-tenth or one-twentieth of value would justify. They are only very small in value as compared with the thin canes, and I am rather afraid they would take up too much of the time of the Sugar Cane Expert, especially as they are a new thing.

58,374. As to tariff duties: is there not always a danger that a high tariff may bolster up an inefficient industry?—I look to competition to improve that. There is always the danger, of course.

58,375. Competition inside the country?—Yes. There is competition, and that competition has led to a very great improvement in the factories. I am not an authority on the subject, but I have the word of Mr. Noel Deerr to that effect.

58,376. Would you agree that improvement has not been due to internal competition in India but to the fact that, even with the present high rate of duty, the Indian factories have found it difficult to keep alive, and therefore they have improved their methods. Is it not the competition with the Java sugar which is wakening them up, rather than with the other factories inside India?—I do not think it matters very much, but there is this internal competition which will rectify a state of things like that. Obviously, if one man cannot get what another man does out of his canes, he will try to improve. I have not followed it out in detail, and I am afraid I am not an authority on the subject, but it occurs to me that internal competition has a good deal to do with it.

58,377. *The Chairman*: On page 754 of your note you say, talking of propaganda, that the advertisement of these improved canes, should be, "under the direct control of the Central Office, although working in full collaboration with the provincial officers." What staff are you contemplating for that particular duty?—Well, I was thinking of one man. He would have the ordinary clerk and peons.

58,378. Do you mean he would advise the provincial officers? How would it be carried out by one man?—Of course, the spreading of these canes would be in the hands of the Provinces to a large extent, but the actual propaganda should be engineered by the central office in collaboration with

the local people. My idea is to get one man fixed for that particular piece of work.

58,379. From your notes on page 756 I gather that it is your view that, judging from the published reports, no successful new seedlings have been put out to replace the Northern India varieties since 1918?—It is not quite that.

58,380. Would you develop that a little?—The three kinds grown now were all sent out in 1918. Every year new ones are being tried. Some of these recur. At present the great bulk of the canes grown in Bihar are the same three canes which were sent out in 1918.

58,381. To the extent that the canes now being sent out are not taking the place of the 1918 canes, I suppose the newer canes cannot be held to be a success?—Well, you cannot tell for four or five years, or three or four years, after the introduction of a new cane whether it is going to be a success or not, so that there may be a number of canes which are going to wipe these out, as I hope there are; and there may be a number of these canes already there but not tested on a sufficient scale to be put out. At the same time, none of those which have been tested and put out have been taken up by the planters.

58,382. I want to discover what degree of concern you yourself feel at the facts which you have set down here. Do you mean that as an indication that the work is not progressing satisfactorily?—It was the expectation when I left India that, the course having been cleared, a succession of better and better seedlings would be put out year by year; and, although rejoicing in the success of the Coimbatore seedlings in north India, it came rather as a shock when I recently found out that, to all appearance, the old ones had not been ousted. I have no grounds for criticising the work of the Cane Breeding Station, and I am not in a position to do so; and I have the utmost confidence that Mr. Venkatraman and his assistants have done the best that they could. In fact, I still hope that there are new seedlings already in Bihar and other places which will replace those being now grown, for the latter are by no means perfect, judging by the reports concerning them.

58,383. *Sir Thomas Middleton*: When a high standard of excellence has been reached, can you in fact discriminate as to the potential merits of the different canes grown at Coimbatore and intended for cultivation under quite other conditions in Northern India?—Such a thing as richness of juice is the same under both. That is the cardinal point. Vigour of growth is more or less similar in all places, but when you take a cane from Coimbatore, where it grows all the year round, and put it in Northern India, there is the factor of the cold-weather period, and there are a number of other factors connected with it. We can test, so far as the vigour of the plant is concerned and the richness of the juice, but questions of disease are not fully treated at Coimbatore, and I think more attention ought to be given to them. The whole question of climate has not been touched. So, when we send a cane out, though it is a good cane it may not suit.

58,384. Good at Coimbatore?—Good at Coimbatore, good everywhere, in that it has vigour and has good juice, but it may not be suited to cultivation in particular localities. Of course there is the matter in growing cane again from the same roots (ratooning), which is an important factor which we cannot test so easily. That takes a long time.

58,385. *Professor Gangulee*: Have you any suggestion as to how a course of studies in agriculture should be given to Civil Service officers in India?—It depends on how much information you want to give to them.

58,386. You attach a great deal of importance to such a short course?—I do not want them to be agriculturists. I do not want them to know

how to plant and grow things. I want them to have a general intelligent outlook on the question.

58,387. A short course?—Yes, and also to get to know something about the work which the Agricultural Department is doing, and the methods on which they are working. It would be quite a short course. I may say that the Colonial Office has greatly increased, since I wrote these notes, their demands of agricultural training for their Colonial Administrative Service, at Cambridge.

58,388. Would you consider that rice breeding and the problems connected with rice production, are of sufficient importance for a central research station?—I should not support the central research station until we have got a series of workers in different parts. We have only about two at present who do work on rice. I think we should have a few more to work on the subject. There is no necessity for a research station at present. There is plenty of work to do. The South Indian rice is very different from the North Indian rice, and that is again different from the Burmese rice, so that it would be more difficult, perhaps, in rice than in anything else, to have a central station. It would require more provincial research.

(*The witness withdrew.*)

Monday, August 8th, 1927.
ROTHAMSTED.

Present:

The Marquess of Linlithgow, D.L. (*Chairman*).

Sir Thomas Middleton, K.B.E., C.B.
Sir James MacKenna, Kt., C.I.E., I.C.S.
Mr. H. Calvert, C.I.E., I.C.S.
Professor N. Gangulee.
Dr. L. K. Hyder.
Mr. B. S. Kamat.
Mr. F. Noyce, C.S.I., C.B.E., I.C.S.

Mr. J. A. Madan, I.C.S.
Mr. F. W. H. Smith } *Joint Secretaries.*

Sir JOHN RUSSELL,
Director of the Rothamsted Experimental Station.

MEMORANDUM ON THE ORGANISATION OF RESEARCH AS AN AID TO AGRICULTURE.

The purpose of research is to obtain knowledge. No knowledge, however, represents the entire truth even about the simplest thing in Nature, and the research worker has therefore to form, if he can, some estimate of the degree of accuracy or trustworthiness of the knowledge he has gained. The knowledge thus obtained has then to be used in agriculture, either by the teacher, for improving his courses of instruction by bringing them more nearly into accord with the truth, or by the agricultural expert, in showing the farmer how to increase the efficiency of his farm operations or to overcome some difficulty.

The gaining of knowledge, and its application, are two widely different functions and can rarely be carried out by one and the same person. As a rule, the best research workers are interested only in solving the problem as completely as may be possible; the solution, once obtained, does not interest them further until it is controverted by some other man of science. Those who best apply knowledge are, in general, people of practical minds interested in completing a task by any better means, regardless of whether the method is well or only incompletely understood. From among a large staff, specially and carefully chosen, only a few members have the power both of obtaining results and of applying them in practice.

An institution that concerned itself only with the gaining of knowledge and not at all, or only to a small extent, with its application, would not satisfactorily serve the purposes of agriculture. The field of Nature is so wide, and Man's resources are so limited, that it is easy for a group of research workers to wander into fields so distant from agriculture that their results afford little if any help to the farmers of this generation. The results may be published in scientific journals, but unless they happened to appeal to the general body of workers in pure science they would simply be buried in the prodigious mass of scientific literature now accumulating. Papers that lie long unknown stand a great chance of being completely lost, leaving only with the author some satisfaction that he did the work and much disappointment that it has been ignored.

On the other hand, where the knowledge gained is utilised by the research institution, either by embodying it in teachers' courses, or by adding it to the equipment of the agricultural expert, or by finding some application of it on the farm, it is not lost, but becomes part of the agricultural life of this generation, and although the research worker may not himself labour to apply his knowledge, he feels great pride and satisfaction when others, by doing so, have ensured that the fruits of his labours will continue to live.

The research institution should therefore make provision for (1) the gaining of knowledge, (2) its application in agricultural education or practice, and it should be recognised that these functions are distinct.

The Gaining of Knowledge.

No human mind can ever grasp the full truth of even the simplest thing in Nature, and it has been found most effective to bring together men having different types of mental equipment, ensuring that each may discover as much as possible. A chemist and a bacteriologist may study the same natural phenomenon and give completely distinct accounts of it: a physicist may see something entirely different from either. These divisions are mainly matters of academic interest: for agricultural purposes the knowledge should be as complete as possible and not limited to whatever can be gained by one worker trained in only one particular way; instead, combined work, or, as it is now often called, team work, is needed. But rigid organisation of team work has never succeeded so far as our knowledge goes; elasticity is absolutely essential, as will be emphasised later on.

Selection of the Staff.

Problems in Nature are so difficult, and accuracy of information is so important, that the research worker's mental equipment must be of the best possible. Each must be a recognised master of his science: this commonly means that he began his special training early and has carried it as far as the best schools could take him. At Rothamsted the scientific staff is chosen from the best science schools in the country. No agricultural knowledge is expected: complete familiarity with the use of his tools is far more important to the agricultural investigator than some diffuse knowledge of the processes used by the farmer in tilling the soil. Only one member of the scientific staff has ever studied at an agricultural college or department, and he only for a short time.

The staff should not only be recognised masters of scientific methods but should also, if possible, have the personal qualities that enable them to collaborate with complete honesty and candour, keeping back nothing of their results from each other. Neither examination results, nor the stilted testimonials of professors anxious to place their men, afford any guide as to the possession of these qualities; the person or committee responsible for the selection must make the best estimate possible. A man trained to play the game, and to recognise, in Kipling's phrase, that "The game is more than the player of the game," is ready to collaborate: others are not. It is not difficult to find trained men of science or honest players of the game: it is not easy to find one man who satisfies both requirements and it is very rare to find one who, in addition, has agricultural knowledge—so rare that, at Rothamsted, as already stated, we never seek the triple qualification.

The Programme of Work.

With a staff so selected, possessing, in the first instance, no background of agricultural experience, or it may be no knowledge even of country life.

the programme of work becomes of prime importance. At Rothamsted it has grown up in two distinct ways:

(1) From the classical field experiments, and the long chain of laboratory experiments, extending now over 84 years, there have emerged many problems making a great appeal to the scientific worker.

(2) The senior members of the staff have acquired, and the junior members are acquiring, a thorough knowledge of their subject: the Physicist is now a recognised authority on Soil Physics: the Bacteriologist on Soil Bacteriology and so on, though on their first appointment neither knew anything about the agricultural side. Coming fresh to the subject, free from pre-conceived ideas and false teaching, but with a thorough equipment in pure science, these men see much that is wrong and more that requires re-examination.

The purpose of the programme is first and foremost the development of the subject. Neither of these two methods, however, would necessarily yield a programme of interest to the present day farmer. The agricultural background must be secured, and this is in many respects the most difficult part of the work in connection with the organisation of agricultural research. The background must not be imposed from above or it becomes unreal like a scene in a theatre: it must be a natural growth with many roots striking deep down. No one method suffices to establish it: many are needed and constant watch is necessary to develop fresh ones, but at Rothamsted the basis is always the same. The entire staff, senior and junior, is brought directly into contact with general agricultural and farm problems in as many ways as possible, so as to build up in the first instance a body of agricultural experience and, finally, to give the necessary agricultural point of view. Among the methods are the following:—

(*a*) The members of the staff are encouraged to visit the field plots regularly and to familiarise themselves with the results; they are also expected to act as guides to parties of visitors.

(*b*) The Farm Director seeks to establish links with every department. In addition he posts a farm diary daily and holds farm classes weekly, which all junior members of the staff are encouraged to attend.

(*c*) Conferences are held periodically at Rothamsted between the staff and practical agriculturists coming from various parts of the country, at which some subject of present agricultural interest is discussed. Papers are read, by farmers and county organisers setting out their problems and difficulties, and by the scientific staff giving data or information likely to help: the papers and the discussion are printed, forming a permanent record. It was at first difficult to get farmers to write papers: now they readily do so.

(*d*) Typical field experiments are repeated in many different parts of the country on good commercial farms: they are visited by members of the staff concerned, and the visit is extended not infrequently to neighbouring farms also. Informal and friendly personal contact is thus established with a wide circle of farmers.

(*e*) The senior members of the staff give lectures to farmers, setting out, in non-technical language, what they are endeavouring to do, and how it is related to agricultural practice. They also write articles in farmers' journals and furnish information to papers and writers.

Co-ordination and Co-operation.

The circumstance that the main purpose of the work is the development of a subject ensures that the work in each department is systematic: the numerous contacts with general agriculture and with individual farmers

ensure that the staff is in touch with practical problems and continuously acquiring the agricultural point of view: there remains, however, the task of blending the work of the various departments and avoiding the growth of the barriers that inevitably arise unless great care is taken to keep them down. At Rothamsted the following methods are adopted:—

(1) The Staff Council at each of its monthly meetings hears from the head of a department an account of his programme of work and discusses it with him.

(2) The whole of the staff, post-graduate and other workers, assemble twice a month (except in the holiday season) to hear an account from some one person of the work he has done and to discuss it. The whole of the work of the Station is thus brought under review before it is published. The laboratory assistants are also invited to attend, when the subject interests them.

(3) The entire body of workers meet daily at 4 p.m. for tea and conversation: there are no formalities, but every worker has the opportunity of meeting every other.

(4) Every junior member of the staff is expected to have a general acquaintance with the work of every department of the Institution, to be able to show scientific visitors round and to explain, in broad outlines, the investigations going on. To facilitate this knowledge statements are drawn up periodically by the heads of the various departments and circulated among all the staff: further, staff tours of the laboratories and fields are periodically arranged when suitable demonstrations are given.

The result of these various activities is that the work of the various departments tends to grow into one whole: much joint work is arranged. there is considerable discussion and interchange of views and in the published papers there are singularly few of the errors in other branches of science that tend to creep into papers published from isolated laboratories.

The evaluation of the knowledge gained.

It is always difficult to know how much significance to attach to experimental results, whether obtained in the field or the laboratories. A Statistical Department has been set up under Dr. R. A. Fisher, one of the functions of which is to scrutinise the design of experiments and examine the results: then to determine what degree of reliability attaches to them. For field work, as for laboratory work, the design of the experiment must be determined by the degree of accuracy desired, and it is very easy, without this statistical help, to overlook some weak place in the design, or to use the results in a way that is not strictly justifiable.

The Application of the Results.

(a) *In Agricultural Education.*—The results of the investigations lead to continuous modifications in the subject: Old ideas and explanations are shown to be untenable and new ones are tentatively put forward. It would be impracticable for teachers to fit the new results to the old: this is done for them by the Rothamsted staff in a series of monographs, in the successive editions of which the subject is brought up to date. These have found a useful place in agricultural literature; the first of them ("Soil Conditions and Plant Growth") is in its fifth edition and has been or is being translated into French, German, Russian, Finnish, Hungarian and Japanese. In addition, a simpler series of books has been prepared, one for use in farm institutes, another for elementary schools in country districts. We attach considerable importance to friendly relationships with

country school teachers because they are training many of the men who will ultimately use our results. Each year the Ministry of Education collects a group of them at Cambridge and I spend a week with them, lecturing and discussing their problems; when I have been abroad members of the staff have taken my place. The teachers are an enthusiastic body of workers and help us considerably in the country districts.

(b) *In Agricultural Practice.*—No such simple method suffices for applying the results of research to agricultural practice. Where the object of the research was simply the development of the subject there may be no direct application, although the better understanding of the real nature of the farmer's problem may lead to improvements in the advice given. Many of the costly errors of the past would have been avoided had the subject been better developed, such as indiscriminate deep draining, the deep ploughing and burying of the surface soil; the wasteful consumption of artificial fertilisers: farmers are now saved such lasses. It is difficult to say how much is saved as a result of this fuller knowledge but it can safely be asserted that sound expert advice is impossible without a well developed agricultural science; if based on empirical knowledge alone it is always risky and sometimes dangerous.

The numerous contacts established at Rothamsted between the scientific workers and the practical farmer leads to frequent suggestions of practical applications. Thus, in the Bacteriological Laboratory investigations into the life history of *Bacillus radicicola* by Mr. H. G. Thornton and Professor Gangulee led to the reopening of the very difficult question of lucerne inoculation with highly important results, so that the process has now become a practical proposition and thousands of cultures are being distributed to farmers with adequate instructions as to their use.

In the same department some earlier work of Hutchinson and Richards led to a method of making manure direct from straw and other vegetable refuse, which method is now being used by numbers of farmers in different parts of the world—I recently saw very satisfactory results on certain prairie farms of the United States. In the Physics Department studies of the physical properties of soils are suggesting modifications and improvements in cultivation, while in the Chemical and Field Experiments departments the studies of artificial fertilisers are leading to a closer adaptation of the fertiliser mixture to the soil and climatic conditions and therefore to a greater economy of the farmer's resources. Applications of this kind cannot be forced, but they are possible only when the scientific worker is frequently and in a variety of ways brought into some kind of contact with farm problems.

A third kind of application is continuously being made at Rothamsted. A certain amount of *ad hoc* work is always in progress—especially in the Plant Pathology and the Apiculture departments—on specific practical problems. At first sight this appears the most promising method of applying science to agriculture: actually it is not, as the solution arrived at is approximate only and, the good being ever the enemy of the best, it may stop further work. There are however problems for which no other method is at present possible and, moreover, it establishes further contacts with farmers to have some practical farm problem under investigation in each laboratory. Departments are therefore encouraged to undertake some of this work but not to regard it as their main business.

(c) *Empire Problems.*—In recent years Rothamsted has co-operated with some of the Empire departments of agriculture for the investigation of problems of great practical importance. The details of procedure depend on the particular circumstances of each case and are arranged after a preliminary discussion. The irrigation and cultivation problems of the Sudan were surveyed by myself in a visit in 1924-5, following which a

detailed investigation of certain outstanding problems was made first by a member of our staff, Dr. E. M. Crowther, who spent a winter in the country, and then by Dr. Crowther in our laboratories and members of the Sudan staff in their laboratories, with visits to Rothamsted during the time they are in this country. Collaboration of another kind is arranged between the Cawthron Institute, New Zealand, and ourselves in regard to certain important entomological investigations. The New Zealand Entomologist, Dr. Tillyard, and our own, Dr. Imms, met to discuss the investigation and an assistant was appointed officially to carry out the agreed programme of work. Still another arrangement is being made in regard to Palestine problems.

The Financial Problem.

The financial problem of organising agricultural research has not yet been solved. It is not simply a question of providing funds: in the United States large amounts of money are available, yet the Directors have at least as much anxiety about their budgets as we in England. The difficulty is to retain the services of competent men without overpaying those who are less successful.

In Great Britain a graded service has been introduced by the Ministry of Agriculture with, on the whole, satisfactory results. Its advantage is that it ensures to the worker annual increments up to a certain maximum so that he knows what his position will be at any given time. Its disadvantage is its lack of elasticity, apparently inherent in Government arrangements, which prevents it from retaining the best of the younger men. The Rothamsted Experimental Station has this year suffered severely from loss of staff. The large fertiliser combines and producers' organisations now involve so much capital that they must have in their service the best men obtainable if they are to keep their superiority over their competitors. The power to gain results of value, which means the combination of science and practical knowledge, is so rare that these organisations are perpetually on the watch for men who possess it. During the past six months no fewer than three among the permanent staff possessing this desirable quality, and including the Chief Chemist, have been attracted to large commercial enterprises and their places have been taken by junior men who cannot be expected to do as good work for some years to come and who may not possess as good a power of achievement. On the other hand, men not so effective are not wanted by the large commercial bodies and therefore remain. There is thus a tendency, which always needs careful watching, for the staff of a research institute to deteriorate with age and this tendency is emphasised by the fact that few men are able to evolve new ideas after the age of about 45, or to adapt themselves to new conceptions in science after the age of 50. The best method of meeting the difficulty is to give research institutions as free a constitution as is possible and to allow the utmost elasticity consistent with good accounting in the administration of their funds.

Oral Evidence.

58,389. *The Chairman*: Sir John Russell, you are the Director of the Rothamsted Experimental Station?—Yes.

58,390. Are you familiar with Indian conditions?—Not directly. I have never been to India. From time to time we have had a number of Indian workers here.

58,391. There are projects in various Provinces to carry out extensive soil surveys. Do you care to give the Commission your view as to the value of those soil surveys?—I could only do so in a general way, not being

familiar with the actual soil problem in India; but in general I should take the soil survey as being the basis of soil investigation and soil improvements.

58,392. Are you thinking of a survey on the mechanical side?—No, I should rather call it a descriptive survey. The mechanical studies would come in, but there would be chemical, vegetation and other surveys made simultaneonsly.

58,393. You attach importance to surveys of that nature?—Yes.

58,394. Have you any knowledge of the cost of such surveys?—It is very difficult to form an estimate, even in our own country. I would rather not give any figure.

58,395. Do such surveys involve the employment of a very considerable staff?—Not necessarily. A good deal of work can grow up, so to speak, as part of the ordinary work of the advisory officers and of the agricultural staff. The essential thing is to have the basis agreed on, so that the various workers are all using the same methods and basing their activities on the same principles.

58,396. On page 775 of your note of evidence, under the heading "The Gaining of Knowledge," you point out how different types of investigators may see the same problem. Is it, in your view, an advantage that several research problems should be under investigation by different research workers at different stations at the same time? Are you one of those who think that a certain degree of duplication is an advantage?—Yes, it is inevitable. You can never get two research workers to agree entirely about their results; and no one research worker can ever get at the whole truth. The only hope of real progress is to have a certain amount of duplication.

58,397. Provided that is not overdone, it is an advantage?—Yes. You are bound to have scientific discussions and controversies. A subject that is exciting no controversy is not attracting very much interest, and usually is not making much progress.

58,398. Are you familiar with the position of the Indian Universities in relation to research work?—Only in a general way. I would rather not make any statement about Indian Universities.

58,399. Are you sufficiently familiar with them to have formed any view as to whether Indian Universities might, by developing their scientific side, make a rather more generous and active contribution towards agricultural research in India?—It would always be wise that anyone proposing to undertake agricultural investigation in India should come over to Great Britain for further training. That is not to be taken as any reflection on the Indian Universities; it simply is the expression of the fact that wide experience is always desirable for a person doing research work.

58,400. At what stage in the research worker's career would you think he should proceed abroad to study?—As soon as he has completed his courses in pure science, and he should stay over in this country more than one year: in general for two years, with the possibility of extension for a third year, if this be deemed desirable.

58,401. You think he would get more out of his experience by coming immediately after his courses in pure science than he would after a certain amount of post-graduate experience in India, when his scientific outlook had somewhat widened?—I think so; but a great deal must depend on the personality of the man. It is exceedingly difficult to generalise about research work and research workers, because research work is essentially a personal attribute. It is like painting a picture or playing the violin; some people can do it while others cannot, and no amount of teaching will ever enable them to do so. Research work is really the expression of what is in a man: if he has not that particular kind of thing in him, he cannot put it out.

58,402. One appreciates that; but I should have thought that there was something to be said for delaying the Indian research worker's European experience until he had had a certain amount of experience in India, so as

to give him something with which to compare that which he sees in this country?—If he were in this country, he would not go on to technical problems; he would be on some scientific problem, so as to learn the methods or observe the methods by which scientific problems are attacked. The fundamental principles are the same everywhere, both in India and in Britain.

58,403. I am thinking of scientific experience in India, not agricultural experience?—Yes, I quite see your point. I recognise that a year's research might enable the Indian authorities to make a better selection than otherwise would be possible, because examination results are not a good way at all—in fact, in some respects they are rather bad. But my feeling is based on the desirability of getting hold of the man before his opinions are too definitely set, and while his mind is still plastic: it is particularly necessary for him to acquire the sense of critical discrimination.

58,404. We have read, on page 775 of your note, your opinion of the difficulty of obtaining research workers on agricultural matters. Would it be an advantage for those who do research work in India to go, at one stage or another of their career, to an Indian Agricultural College?—I do not know that it would. We have found no necessity for it here. If the agricultural background is in the institution, the man should acquire the agricultural point of view and the agricultural knowledge, without going through a set course. It is rather undesirable to break into a man's career once he has started.

58,405. *Professor Gangulee*: What precisely do you mean when you say "agricultural background"?—An appreciation of country life and a sympathetic understanding of the countryman's point of view. A man coming from a college has acquired, so to speak, the academic background, but he often has little knowledge of country life and of the countryman's point of view; he must acquire this if he is to be of much use to farmers. We have known townsmen go into the country to help the farmers, and fail, not through any want of good will, but simply because they could not get hold of the farmer problems, nor express themselves in such a way that the farmers could understand them. When a man lives in the country, and comes into contact with farmers and their problems, he gradually widens his point of view, and acquires a more human appreciation of the farmer.

58,406. *The Chairman*: Do you attach value to the association of teaching with research?—Yes. We are feeling the need of it here. We get round the difficulty by going to Universities and giving lectures. Most of the senior members of the staff lecture not only to farmers, but also to University students. I do a fair amount myself, both at English and at American Universities.

58,407. Provided the research worker is not asked to do too much teaching, you think it is an advantage to his research work that he should do some?—Yes, it is. It ensures that he periodically envisages the subject as a whole. The research worker tends to get rather into a groove. His own subject looms up more and more in his mind the longer he works at it, and it tends rather to obliterate other things. Before very long his own work begins to suffer rather. If, periodically, he has to review the subject as a whole, he gets fresh light on his own problem, and he is brought into contact with new ideas. In particular, he has the stimulus of having young people round about him, people who sometimes ask him some awkward questions that he has to think about. He may even discover that some of the things he had accepted as facts or principles, and on which indeed he may have been basing much of his own work, are not entirely correct, and want re-examining.

58,408. A witness told us that he thought specialists were people who got to know more and more about less and less. That is the danger to which you are making reference?—Yes. I attach very great importance to the selection of staff, because, unless this is well done in the first instance, no

amount of organisation can ever put matters right. I want to emphasise again that research work is the expression of something that is in the man, and cannot be put into him if he has not got it.

58,409. By a series of expedients you make a deliberate attempt to break down the tendency of research workers to get into compartments or isolation?—Yes, I give these simply as illustrating the methods that we adopt here, recognising that in other institutions some other methods might be better.

58,410. Then, you appear to have an arrangement here by which all grades meet each other once a day at tea?—Yes; we attach great importance to the constant meeting of all members of the staff without any distinction whatsoever.

58,411. You have an Agronomist here?—Yes, a Farm Director, who has the supervision of the whole of the farm work; also the Guide Demonstrator, whose primary function is to demonstrate the plots to farmers and other visitors. Then there is the Ecologist, to study the relationship between plant growth and external conditions with particular relation to the external conditions, and the Plant Physiologist, to study the plant growth from the point of view of the plant. They have a laboratory up on the farm, which we shall visit this afternoon. These workers meet periodically in my room, when we discuss the farm and field plot situation, and allocate any duties and responsibilities.

58,412. Would you give us a definition of the Agronomist's responsibilities?—I could not give you a rigid definition, because we do not work on rigid lines here. Broadly speaking, however, the function of the Agronomist is to see carried through all operations that have to be done on the plots. He does not design the experiment.

58,413. *Professor Gangulee*: Is he responsible for the technique of field trials?—No.

58,414. Who designs that?—That is worked out in this way: First of all, the necessity for the experiment is agreed upon. The details are then discussed by this small group of workers. Some idea is formed of the kind of accuracy that is wanted, whether the experiment is to be a highly accurate one, whether what is known as a standard error of, say, two per cent., or a standard error of ten per cent., would be permissible; or whether it is only going to be an observational experiment. Then, knowing the degree of accuracy that is wanted, the whole thing is referred to the Statistical Department, and they determine the kind of experiment we shall have to make, and suggest schemes that will give the necessary accuracy. These are then put before this Plot Committee, and the Agronomist tells us which of the various schemes would most easily be carried out. Finally, some form of experiment is agreed upon which satisfies the requirements of the Statistical Department as nearly as possible, and can be carried out in practice by the Agronomist.

58,415. *The Chairman*: Is the Agronomist responsible for the statistical work?—No; the statistical work is very specialised.

58,416. That is quite separate?—Yes.

58,417. What ought the training of an Agronomist to be?—He should have some knowledge of the sciences on which the experiments are based, in order that he may be interested in the work, and appreciate what is done in the scientific laboratories. But, first and foremost, he should be a sound practical man, able to get things done on the farm and to carry out operations successfully; correctly gauging the weather conditions, knowing the best type of implement for the purpose, and, generally speaking, able to achieve good results in the best way and the most economical way. Like the research worker, he must have certain personal qualifications; he must be able to interest the scientific workers in the happenings on the farm,

so that when something unexpected turns up he will be able to persuade the person most nearly concerned, to leave his laboratory and go and have a look at it.

58,418. Does the Agronomist require any particular mathematical training?—No; he requires no specialised scientific training, but simply sufficient to appreciate what the scientific worker is trying to do. The difficulty with the Agronomist who has no scientific training is that he is apt to look upon experiments as rather trifling things; to find harmless occupation for certain people; he then takes but little interest in them. When a man has got some scientific training he sees the purpose of it, and he gives it the attention that it really deserves.

58,419. Do you attach great importance to the Statistical Branch?—Yes, very great, as a control. The Statistical Branch should criticise the design of the experiments, and evaluate the results, so as to be able to tell the worker whether the deductions that he is attempting to draw are really justified by the figures. It is a weakness of much of the agricultural work now being done that elaborate deductions are repeatedly drawn on really insecure bases.

58,420. It is regarded as sound practice to wait until every test has been applied to a particular result before issuing that result as the official publication of the station?—Yes.

58,421. Does that practice, sound though it be, involve on occasions a certain waste of time in other stations where, if the workers could have early intimation of the results communicated privately, they might save themselves a deal of time?—In practice there is a good deal of private intimation. We know personally the men in this country and many of those elsewhere who are engaged on lines similar to our own; in practice, they know pretty well what work we are doing and the kind of results that we obtain. But I do not think one could establish any formal sort of relationship that would ensure one worker knowing what another was doing, beyond, perhaps, the circulation of a programme of research, which is done in this country.

58,422. You would be inclined to encourage informal communication?—Yes, by every possible means. There, again, the matter is essentially a personal one. You cannot compel informal communications. It is rather a matter of personal friendship or personal predilections. It all comes back, really, to the careful selection of the staff.

58,423. Have you any considerable experience of Indian students who come to this country and of their work?—Yes, of those who come here.

58,424. How many have you had here during your time, speaking approximately?—Dr. Keen tells me that about 12 have been here for a considerable time. We have had more than that for shorter periods.

58,425. What do you say about their equipment in pure science when they come to you?—It has been variable, distinctly variable, but, in general, the men who come here have been very carefully selected. We have had very good men here—Professor Ganguleo will excuse me saying this as he was one of our people. Some, however, it has been desirable to send to some English institution for further instruction before they began their work.

58,426. Have the post-graduate Indian students whom you have had here shown the qualities required for original research work?—In the main, yes. Again, I would emphasise that they were selected before they came here. The men who come here are usually sent by some Government Department and at its own expense, commonly for two years, and sometimes for three years. The Department has a good deal at stake, and naturally takes great pains in selection.

58,427. From your experience of the equipment in pure science with which students have come to this country, can you point to any weakness in the University training in India? It has been suggested that the scientific training in India runs rather too much on the book and too

little on the bench?—It would perhaps be easier to judge of that from my experience in reading theses for doctors' degrees in Indian Universities. There perhaps the selection has not been quite so rigid as for the men who have come here, and consequently one is nearer the good average. There are two directions in which improvement would be desirable; one would be a better sense of criticism: the other, a fuller appreciation of what the subject really means. As the result of this lack of a critical sense there is a tendency to build upon them too big a superstructure on results which are inadequate. How far that may be a national characteristic, or how far a matter of University training, it is not for me to say. It may be the classes are so large that the Professors have no opportunity of instilling into their students this critical sense. The trouble is not confined to India. One finds it in American Universities where the numbers are very large, running to several thousand students, and where, consequently, there is a lack of personal contact between the Professor and the students.

58,428. It is extremely difficult to make up the deficiency of training in later years, is it not?—Yes. That is one reason why we like to get post-graduate people as young as possible before they have passed the age when they are still open to impressions.

58,429. May I ask you a question or two on the direction and administration of a research station? To what extent must the direction be a personal matter on the part of the Director, and to what extent can he lean on the direction of the Governing Body, or whatever organisation may be in control?—I think the function of the Governing Body should be rather to lay down general principles, to determine from time to time the purposes for which the station is to work, to provide the funds, to supervise the selection of the staff, and satisfy itself that the nature and quality of the work are satisfactory. The members should be men of wide experience, with power of judgment and of selecting people. I do not think it desirable that the Governing Body should concern itself too much with the details of the work.

58,430. Can the Governing Body influence the direction in which research is prosecuted?—Most decidedly. It lays down the general principles on which the station is to be run. They determine as a fundamental principle, that the purpose of the station is primarily the gaining of knowledge that gives the general direction to the research work. On the other hand if they determine that the station is for the purpose of solving the immediate practical problems of the farmers, that would give an entirely different direction to the research work. In that way the Governing Body decide what kind of work is to be done. Then they would be in close touch with the actual work itself and would determine whether or not the programme was good.

58,431. *Professor Gangulee*: But they do not go into the detailed programme of the research work carried on at the institution?—Are you speaking of our Governing Body?

58,432. Yes?—No. Our Governing Body have it before them to satisfy themselves that it conforms to the general principles laid down for the management of the institution, but they leave to us who are here a wide discretion in all matters of detail.

58,433. *The Chairman*: Do you regard yourselves at Rothamsted as working for Scotland as well as for England?—Yes, we regard ourselves as working for the whole Empire—indeed for the whole world. You cannot fix barriers to agricultural science.

58,434. That is what I expected you to say, but if it were felt in Scotland that your work was devoted more to English objectives than to Scottish, would it be possible, by putting a Scotsman on the Governing Body, to satisfy the Scottish people, and, on the other hand, to bring Scottish points of view on the technical side before your Governing Body

and so influence the course of research?—I do not think that aspect comes in. We are concerned with agricultural science, which is the same everywhere. You cannot speak of Scottish agricultural science, or English agricultural science. The same laws of nature hold in Scotland as in England, and our purpose is to discover those laws and to put our information in such a form that it can be utilised by teachers and experts everywhere. We have, as a matter of fact, invaded Scotland, having experiments at two or three farms there, but no question of that kind has arisen. We are in constant touch with the Scottish workers in agricultural science.

58,435. Indulging your imagination a step further, and assuming that Scotland instead of being rather a colder country than England, was a tropical country, would the same general principle hold good, that the principles of agricultural research would be the same for Scotland the tropical country and for England the temperate or sub-tropical country?—Yes, the same principles hold. The application differs, and also the perspective. The farmers' problems are the resultant of the action of natural forces: the forces are the same everywhere, but the resultant differs.

58,436. To what extent do you think the problems of tropical India are profitably dealt with at Pusa, which is not in the tropics?—I prefer to answer that in a hypothetical way rather than indirectly, because I have not been to Pusa and I do not know exactly what the conditions are. But suppose Pusa took the line that their business was to investigate the general principles underlying the agriculture of India, and supposing Pusa could establish relationships with experimental farms and colleges in different Provinces, friendly relationships based on respect for the Pusa work, so that the officers of those institutions would naturally look to Pusa for help—I do not mean that they would be compelled by any regulation but that they would naturally do so—then Pusa would be able to contribute materially to the development of Indian agriculture. They may be doing this now. I am not implying they are not, but I am simply laying down the general principle that should be followed.

58,437. So that the prestige of Pusa with the Provinces would depend entirely on the quality of the work being carried out at Pusa and on the calibre of the men who were doing the work?—That is so, and no official arrangements or organisation could possibly override that fact

58,438. No representation of provincial officers on the Governing Body?—No, I do not think it would come in at all. If the Pusa people command the respect of the provincial colleges and stations, they will have the leadership, even if the Government should decree otherwise.

58,439. There is no reason why an attempt should not be made to satisfy provincial opinion on both grounds, namely, to satisfy the expert opinion of the Provinces on the basis of the excellence of Pusa's work, and the other and less instructed Provincial opinion by some attempt to give representation on the Central Body?—It might not hurt Pusa at all. There might be some political advantages in such representation, and I should not regard it as greatly influencing the work. It would be far better for the Pusa staff to be in direct contact with the problems in the Provinces than to have the Provincial point of view presented to them at second hand by someone on their Governing Body.

58,440. As regards European workers at Pusa or other research centres, what type of engagement would you favour, the short term or the long term?—I doubt if you could get the type of man you want on a short-term engagement. There might be something to be said for having juniors for short terms, to see whether they like the life and the work; terms that would enable them to retire gracefully if they did not. But for seniors, I think you must have the long term.

58,441. Is there a dearth of first-class research workers at this moment?—There always has been. There is a chronic dearth of first-class men in all countries.

58,442. Has that fact some bearing on the importance of central research stations? May it not be that, as regards certain types of research work, it would be almost impossible to staff institutions in each and every Province because there would not exist enough first class men, skilled in such subects, to fill the posts?—That is so; but more important is the necessity of bringing together men of different points of view. No one man can envisage the whole of the problem: he can only see one part of it. The agriculturist is not specially concerned with what the chemist may think of his difficulties; he wants to get as much information as he can about them. The chemist, the physicist, the biologist and mathematician may all be needed to study the problem from their different points of view, obtaining as much knowledge as they can about it: then their knowledge must be welded into a whole before the agriculturists can benefit much from their work.

58,443. How does that bear upon the need for central research stations?—In this way: The number of men who can do the work is limited, and the number of those who can collaborate one with the other is even more limited.

58,444. How often should a Governing Body meet?—Our Governing Body meet four times a year for about an hour and a half, and that arrangement has worked very well for many years. I think it is quite a good one. It enables them to see that the principles are maintained, and to give them all the help that they want in maintaining their general oversight.

58,445. They get through their work in about an hour and a half?—Yes.

58,446. It is not a matter of self-control on their part; you do not apply the guillotine?—No; they are a highly-efficient body of men, accustomed to apprehend the facts of a situation, and to form a correct judgment thereon. I might say how our Governing Body is elected. It is composed of eight members: Four elected by the Royal Society of London, two by the Royal Agricultural Society, one by the Chemical Society, and one by the Linnæan Society. They elect their own Chairman, who by custom is associated with the land: the present Chairman is Lord Clinton.

58,447. Are you familiar with the working of the Development Commission?—Only as an applicant for grants.

58,448. Have you formed any view as to whether the principle involved in the Development Commission and the working of that Commission, and the fund which it administers, are favourable to progressive agricultural research?—I think so. They adopted, in the first instance, the wise principle that the research institutions should be specialised and that each should not attempt to cover the whole ground. That enabled us to assemble a better staff for our group of subjects than would otherwise have been possible. They adopted another principle which on the whole has worked reasonably well: that the industry itself, or some other organisation, should put up part of whatever capital is required. That ensured that where extensions were desired it was necessary to satisfy, not only the Development Commission, but some other authorities also, of the need.

58,449. *Sir Thomas Middleton*: You have emphasised the importance of soil survey in connection with agricultural work?—Yes.

58,450. What type of soil survey had you in mind?—A general descriptive survey.

58,451. You had the establishment of types in mind, not necessarily the mapping of the area to which the survey applied?—I think the mapping should be done as well. The purpose of the soil survey should be to give information to the soil investigators so that they might know what are the important problems; secondly, to give information to the agricultural

experts and to the best farmers as to the possibilities of those soils. It would then be for the experts and farmers to decide which among the various possibilities was the most economic or feasible.

58,452. You recognise that to attempt to map, on the field, the position of soils is a very lengthy and costly business?—That depends on the degree of detail, which is governed by the closeness of settlement and the economic value of the area.

58,453. What you attach most importance to is the definition of soil types. You cannot expect to lay down boundaries?—No, I should prefer to say descriptive rather than bring in the idea of definition. In a survey such as I contemplate, an extensive hill region, if thinly populated and agriculturally unimportant, could be dealt with in a few sentences, while a highly fertile closely settled plain could be studied in any degree of detail that was desired.

58,454. Supposing India were to wish to undertake a soil survey at the present time, are we in a position to suggest to them the proper methods to follow?—Not entirely, because the sense of proportion must have an economic background. It would be superfluous to attach equal importance to all the regions. Some regions would have to be studied in close detail and others need little if any attention. Where important practical problems arise, such as soil erosion, irrigation or alkaloids, considerable detail might be needed. On the other hand, where there is no outstanding problem, but a general system of farming already established which on the whole is reasonably successful, then very little detail would be needed.

58,455. Do you have in your mind a survey of the Russian type rather than the type which the United States first adopted?—Not quite. The present Russian survey ignores the utilisation of the soil. I should prefer a survey where this was brought into greater prominence

58,456. You suggest the present American method of survey as a suitable one?—I should prefer our own methods in a modified way. Our detailed methods would be applicable where there were outstanding problems.

58,457. When referring to "our own methods," were you thinking of your own original method as applied in the Kent and Surrey survey?—That has been modified subsequently. I should say the methods at which we have arrived now.

58,458. Or at which we are trying to arrive?—Yes, at which we are trying to arrive. It might easily happen that the Russian methods might be utilised for the general classification of the Indian soils. Probably the Russian methods would classify the Indian soils into five or six very big groups. I have had opportunities, during the last two months, of discussing this matter with the Russian workers, and I did not gather that their classification, taken by itself, gave agriculturists much information that they do not already possess.

58,459. The kind of survey which has been carried out to some extent in India has been one where, as in the Madras Presidency, types have been studied by the sample method. Would you regard that as a useful preliminary piece of work?—I think the field method is the best preliminary—to go over the whole region and make a general survey. Then, having done this, one can decide which areas require to be more extensively cultivated, and there economic considerations come in.

58,460. For that field survey you must have a staff available?—Yes.

58,461. If you take a chemist working in an Indian Laboratory and wishing to get certain information about local soils, there may be no method open to him other than collecting samples and examining them. I want to get your view as to the probable usefulness of this method?—If it is done casually I should not think it was very useful. It is best

done in relation to some definite problem, such as an irrigation scheme, or erosion, or other problem of soil fertility.

58,462. Your opinion is quite definite that the best time at which any young scientific worker should begin research work in an institution such as this is after he has completed his academic studies?—Yes. I am speaking now of the young worker from India.

58,463. That postulates that the young worker has had a thoroughly good scientific training?—Yes. In point of fact, we have sometimes found it necessary to supplement his training when he has come here, so that it has not infrequently happened that we have sent a man to some other institution for the first three months or the first six months to strengthen his training in certain respects.

58,464. You have referred to the great difficulty of getting good scientific workers all the world over. Would you agree that any country which expects to produce scientific workers must have strong scientific schools in its Universities?—Certainly.

58,465. Must we not begin with scientific schools in the Universities before we can begin to develop technical institutions at which research workers are to study agricultural problems?—Yes, the University is the true basis.

58,466. What would have happened to Rothamsted if you had not had the scientific schools of England to draw upon for your workers?—We could not have done much. I do not urge that every University should have these science schools: this might be impracticable; but at each University certain lines of work should be developed, and students interested in the one line would naturally congregate there. It should always be possible for students to transfer from one University to another to study special subjects.

58,467. In discussing the relations of Pusa to the provincial workers, you emphasise the importance of direct contact?—Yes.

58,468. In this country we have had an Agricultural Education Association which includes most of the agricultural workers in the country?—Yes.

58,469. To what extent have you found that body useful in connection with your work at Rothamsted?—Very useful. We meet the members of the Association formally twice a year at Christmas and in summer, and informally much more frequently. The advantage of the Association is that it gives us a list of the men working in the field in contact with the farmers. If we want to go into any county or want any information about any county, we know at once to whom we can write.

58,470. You secure access to farmers through members of the Agricultural Association?—Yes, and further, these men, having periodical opportunities of meeting our staff, come down here and see the work which is going on, and frequently arrange to bring a party of farmers round. They also ask for lectures to be given in their counties.

58,471. What is the total number of scientific workers at present engaged at Rothamsted?—Approximately fifty trained scientific workers and something less than that in the way of highly trained assistants.

58,472. There is one point in relation to the supply of scientific workers which fills me with concern, if not alarm; you say: "Few men are able to evolve new ideas after the age of about forty-five, or to adapt themselves to new conceptions in science after the age of fifty."—Yes; it is a sad truth.

58,473. My anxiety was lessened when I learned that you prepared this statement on your way back from America; perhaps your impressions of "too old at fifty" were gained in the United States?—No; I deliberately stated that to emphasise the fact that one has to make careful selection all the way through. You cannot select at random.

58,474. *Dr. Hyder*: As regards Indian students coming for a year's training at your Institute, do you not get students direct from Cambridge or some other University specialising in natural science who have obtained First Class in their Natural Science Tripos or who have obtained scholarships, or do you get students sent to you by the Government of India?—They are mostly sent to us by the Government of India. We have a certain number of Indian students coming from Cambridge who spend the whole or part of the long vacation here.

58,475. That is in order to get their degree or diploma at Cambridge?—Yes. It is not necessary for the diploma that they should come, but they are interested in working at Rothamsted, and we arrange that they can come.

58,476. I was wondering whether the best type of Indian student was demanded by the Indian Civil Service?—I have never had the opportunity of comparing the men who come here with the men who go in for the Indian Civil Service. In general, I think our men have come from the Indian University rather than from Cambridge.

58,477. As regards your station, is it a station that is concerned with finding out truth in natural science or is it a station that is concerned with making conjectures about the application of principles to practical problems of English agriculture?—The station was founded eighty-three years ago by Sir John Lawes for the immediate purpose of increasing the productiveness of the land, but this purpose widened almost at the outset. From very early days its function has been to obtain knowledge about soils and the growth of crops. That is our function still, to obtain knowledge and then put it in such a form that it can be used by teachers and by experts. We do not ourselves necessarily seek to solve a particular farmers' problem, although incidentally we do so.

58,478. You are concerned with the application of the truths of pure science, not their application to any practical difficulties of the farmers but to English scientific agriculture generally. For other purposes England depends upon Cambridge and places of that kind?—We are not concerned with the development of pure science, but with the study of the sciences that underlie agriculture and country life.

58,479. As regards the recruitment of research students at Pusa, both Indian and European, at what age do you think we should recruit those men?—We should prefer to get them young, whilst they are still adaptable. We take them from the scientific schools of the University, because it is imperative that their science should be sound and beyond reproach. They must then acquire somehow the agricultural outlook and the farmer's point of view, in order that they may properly appreciate the agricultural problems. All this requires that a man shall be young, otherwise he cannot do it.

58,480. Have you been asked to advise the Government of India as regards the recruitment of people who may take up such posts in India?—I cannot remember that I have been directly consulted unless a man has happened to give my name as a reference. I would not like to speak too definitely on that point.

58,481. We have this system of service: when once a man gets into the service he cannot get out of the service?—Yes.

58,482. Do you think it would be better first to engage these men on a short term contract and then, if they proved successful, to give them so much more money to retain them?—I put it the other way. For the senior men you must have a long term engagement. For the junior men it may be an advantage to have a short term. I would rather not put it more definitely than that.

58,483. Pusa is a somewhat small and out of the way place, with a number of research workers living in isolation. How do you keep concord and harmony here?—It is entirely a personal matter.

58,484. Does the practice of meeting for tea help in that direction?—I dare say that helps to some extent. You are back again on the question of the selection of the staff. Our staff is mixed, men and women, and I think that is an average.

58,485. *Mr. Noyce*: I understand from your note and from your reply to Dr. Hyder, that the main purpose of Rothamsted is the acquisition of knowledge?—Yes.

58,486. Is the practical application of that knowledge a secondary consideration?—No.

58,487. The impression I got from your note was that the practical application is rather secondary?—I wanted to give the impression that the application may be more difficult, but it is not a secondary purpose. It is second in time, as Dr. Keen points out to me, not second in importance.

58,488. My impression was based on the paragraph on page 777 of your note, in which you seem to me to convey that?—This refers to *ad hoc* work, which we do put second in importance, because it is not necessarily of paramount value. You have to give the farmers some kind of working solution very soon; if you embark on a five-years' investigation, the problem may have disappeared before the end. So you do something that will enable him to deal with it at once. But the method you propose may not be useful to many other farmers.

58,489. The *ad hoc* work that you are referring to here is only a branch of the practical application?—The *ad hoc* work refers to some problem that has arisen in the course of the farmer's work, on which the ordinary agricultural expert cannot give satisfactory advice, so he turns to us. We cannot give satisfactory advice either, because we do not know. Then we may make some experiments, rough, tentative experiments, of perhaps ten per cent., or even twenty per cent., order of accuracy, which will, nevertheless, give the farmer sufficient information for his purpose, but we could not regard the answer that we gave as one which might hold in another County or in another region.

58,490. Whose business is it to apply practically the results of Rothamsted? What is the real link between you and the farmer?—There is no one link, because the farmers in England do not like official methods at all. The links must be informal and personal. I have mentioned various ways in which we are trying to establish them. We also try through county organisers and other members of the Agricultural Education Association to whom Sir Thomas referred. We bring farmers here as often as we can: the place is always open to them. The County organisers receive our reports directly they are printed, and so have general knowledge of the work we are doing. In their meetings with us they bring to our notice any problem that is troubling them in their district. Other problems are brought to our notice in our lectures to farmers. Then also we have outside experiments in various parts of the country, which are visited by members of the staff. I am starting off in a day or two on a round of visits. At each centre I shall meet the farmer who is running the experiments, and he collects several local farmers as well, so that I get opportunities there of discussing agricultural problems and conditions with men in many different parts of the country.

58,491. You have about twenty of these outside centres?—Many more than that. We can find out in the course of the morning how many, but it is a considerable number.

58,492. You mentioned experiments on good commercial farms?—Yes.

58,493. Do they answer to what we call in India "demonstration on the cultivator's own land"?—Ours are not necessarily demonstration. In some

cases we are trying to obtain knowledge. We have carried out experiments on our own farms, and we know the result there, but we want to discover how that result might be modified under different climatic or soil conditions.

58,494. They are experimental, not demonstrational?—They are not necessarily demonstrational.

58,495. How long would an experiment last on each farm?—Unless the farm turns out to be quite unsuitable, we always carry it on for several years.

58,496. Could you tell us how your Staff Council is composed?—Of heads of departments, and two members elected by the staff, who are not heads of departments. They meet once a month.

58,497. When you were being asked about the relationship between Pusa and the provincial departments of agriculture you mentioned the necessity for direct contact?—Yes.

58,498. Have you any ideas of how that contact can be best secured?—No, I would not like to say that. It is entirely a personal matter and depends on the personality of the people concerned.

58,499. There is a general feeling in India that Pusa and the Provinces are not in such close touch as is desirable. It is essential that that touch should be secured somehow?—Yes. Assuming there to be a lack of touch, I should suggest, if I were out in India, that the Pusa staff be invited to meet the provincial staffs so as to try and arrive at some means whereby they could secure closer touch, and see if the persons themselves could hammer out some way of doing it. I think you would get better results that way than by imposing some method on them.

58,500. Personality is really the important thing?—That is the whole thing.

58,501. *Sir James MacKenna*: Do you think it would be a good thing if members of the Indian Agricultural Service were encouraged to take study leave at Rothamsted, or could an arrangement be made to take a man for work for a year without upsetting arrangements here?—Yes, I think it would be a good thing, and we should welcome an arrangement of that sort.

58,502. It is a thing one might lay emphasis on as desirable?—Yes. We should not necessarily keep him here the whole time, because when he arrived it might appear more useful for him to put in part of his time at some other institution, but being in touch with all the institutions we could easily make the necessary arrangements.

58,503. It would be an advantage to the student?—Yes.

58,504. The method of training on the scientific side for our Agricultural Department has been to put the student through a three or four years' agricultural course, and if he shows any particular bent for chemistry or economic botany, to make him specialise in that. Do you think it would have been better if, instead of giving this general agricultural course, we recruited our chemists and economic botanists from the Universities, after they have taken degrees in pure science?—Yes, I am strongly of opinion that the scientific workers should be recruited from the schools of pure science and not from the agricultural colleges. On the other hand, agronomists, or men who are going out to advise the farmers, can be recruited from the colleges of agriculture.

58,505. But for chemists or botanists, it would be better to take a man who had made his mark in pure science?—Yes, and frequently, also, for directors.

58,506. And let them get their agricultural training after specialising as economic botanists or agricultural chemists over here in an agricultural college?—No. I think it should be the duty of the Director or the Executive Authority, whoever they may be, at the research institution, to ensure that everyone can acquire the necessary agricultural knowledge at the institution itself.

58,507. *Mr. Calvert*: Are you thinking of the Director of the institution or the Director of Agriculture?—The Director of the research institution. I understand you are speaking now of recruitment for the research service?

Sir James MacKenna: Yes.

58,508. *Professor Gangulee*: What is the procedure you follow in selecting the research staff of your institution?—We keep in touch with the scientific schools of the Universities in varied ways, partly by attendance at the British Association where the Professors meet, partly by giving lectures at the Universities, especially to the scientific societies of the Universities, and partly by maintaining friendly relationships with the men who are studying pure science, who take Chairs of pure science. We know personally, between us, most of the Professors of Chemistry, Botany, Physics and Mathematics. If it appears that a promising student might like to take up agricultural work, we do all we can to facilitate his doing so, and we may bring him here by some means or other. He might get a scholarship from the Ministry of Agriculture: these were set up by the Development Commission, and they have proved very useful. Alternatively we might find some fund or other means to do it, but in one way or other it would be done. We never let a good man go by: if he desires an agricultural career in our subjects he is got here somehow or other, on some informal or temporary or scholarship arrangement, perhaps for a year. This enables him to see whether he would like the work and the life, and it enables us to see also whether he would be likely to fit in to our organisation. If it seems that he would not, he departs. If it seems that he would, then he stays on, and by the time that he is permanently appointed on the staff we all know him pretty thoroughly.

58,509. Have you a Selection Committee?—As a rule, selection really grows up. The idea develops that a certain man is very good and we ought to keep him, and we do keep him.

58,510. *Mr. Kamat*: By "we," whom do you mean?—The Institution.

58,511. The Governing Body has the final voice?—Yes; but in practice they accept the decision made here on the spot.

58,512. *Professor Gangulee*: In answer to Sir James, you said you preferred to have your men from the Universities rather than from the agricultural colleges?—Yes, this being a research institution. My remark does not apply to the Agronomist; he should be trained at an agricultural college or at an agricultural department of the University.

58,513. You try to secure an agricultural background in the Institute itself?—Yes.

58,514. On page 779 of your note of evidence you refer to the difficulty of retaining the services of competent men without overpaying those who are less successful? Could you amplify that statement?—Our graded service was introduced some years ago, and it has been, on the whole, satisfactory. But as it is not elastic it offers no way of retaining a good man who has been asked to join some other organisation at a higher salary. If the graded service could be made elastic, that difficulty might be overcome. In any staff where you are expecting three qualifications, only a limited number can, in the nature of things, emerge very successfully. All of them have to have a scientific training; they have to acquire the agricultural background, in order to have the power of applying their results in practice, and finally they have to have certain personal qualities. You can only expect a certain proportion of men to have, in any high degree, the power both of obtaining results and of applying them. When a man has shown that he can not only obtain results but can apply them in practice, he becomes very valuable. These commercial organisations and growers' associations to which I have referred in my note also recognise his value. They are greatly in need of such men and always on the look out for them; they have so much capital at stake that the amount of salary is immaterial, so they begin at once by offering a man considerably more than he is getting here, and, if need be,

they will pile something on top of that, and it makes it very difficult for us to hold him on an inelastic, graded system.

58,515. Can you suggest how lack of inelasticity in the graded service can be got rid of?—I have various suggestions, but have not yet found anything that satisfies the Ministry. That is our outstanding problem at the moment.

58,516. Do you think setting up an efficiency bar would solve the difficulty?—I do not think so, because a man might do extraordinarily well in an institution as part of a team, and yet he might not possess some particular qualifications that would induce a commercial organisation to acquire his services

58,517. Have you a Provident Fund for the Staff?—Yes

58,518. A system of insurance?—Yes, it is the University Superannuation System.

58,519. Do you find that the administration duties take up a considerable time of the heads of departments?—A certain amount of time is spent in keeping in touch with farmers and agriculturists. That work rather tends to grow. We have in recent years begun to work for the Empire as well as for the British Islands; this has necessitated visits to other countries. But, broadly speaking, I cannot say that the actual administrative duties take up much time, simply because the place runs so well. It is like a well-oiled machine, running almost automatically.

58,520. On the Governing Body, I see that the staff of the Institute is not represented? Is that a sound principle?—I think so. We have never felt the necessity for representation on the Governing Body. I am not a member of the Governing Body, and I have never felt any disadvantage. The method of selection of our Governing Body implies that they shall be men of science: The Royal Society, the Chemical and Botanical Society select six out of eight. They are entirely sympathetic to the staff, and we could wish for no better representatives.

58,521. Is the research programme of the Institution drawn up by your Staff Council?—You can hardly say it is drawn up by anybody. It grows up, but under constant watchful guidance. We began with certain problems arising out of our classical fields. Other problems are constantly being brought to our notice from outside sources: others arise in discussion on the work at the Staff Council and more particularly in the Colloquium meetings which are held twice a month.

58,522. Do the heads of departments submit to you the work they propose to do in the Institution for a year or so, and are those programmes submitted to the Council for consideration?—Yes. Each head of department presents to the Council his programme of work, so that during the course of the year we get all round the heads of department, and have all the work of the Institute under review.

58,523. Does that programme go to the Governing Body for sanction?—Yes. At each meeting of the Governing Body I give an account of certain sections of the work, and in the course of the four meetings I get round the whole Institution.

58,524. So that you act as Secretary to the Governing Body?—Yes.

58,525. The Staff Council has no administrative function?—For some of our domestic affairs. But in the main it is rather a discussing and an advisory body. The Staff Council would not say to a head of department, "You must do such and such a thing." But it might urge the desirability of a certain course of action, and the recommendation carries very great weight. If it could happen that a head of a department were not playing the game the Staff Council would soon let him know what they thought of him, and so should I too; but they are problems which do not arise.

58,526. If you were asked to introduce provincial representatives in a central research institution like Pusa, would you put them on the Governing Body or on the Council of Research?—If you are going to have a big body,

which seems to be implied from provincial representation, I should prefer a Council with not too great powers of interference. I think a Governing Body is always better to be small and to concern itself with principles rather than details. You may, if you think it advisable for creating interest or securing co-ordination, set up a Council as well, but the functions of the Council, I think, should be advisory rather than directly administrative. It is always difficult when there is a big Council to act with the promptness necessary in a research institution, and particularly to secure elasticity.

58,527. The Provinces are interested only in research problems?—Yes.

58,528. They are not concerned with the administrative aspect of a central institution?—No. It does not matter to the Provinces how the results are got as long as the results are turned out.

58,529. Are you, as an institution, in touch with the Pusa workers?—Not formally.

58,530. On the question of providing funds for agricultural research, does this station depend on the annual grants from the Ministry?—Very largely. The Ministry grants about four-fifths of our income. We have an endowment which gives us a certain amount, not very much, and then we have subscribers and donors who provide the rest. The difficulty in a research institution is always to balance the accounts. A research institution is not like a college; it cannot be run on a rigid programme of expenditure. Some work may arise during the course of the year which has got to be done, or more important still, somebody emerges from one of the scientific schools whom you want to bring to the institution, and suddenly the money has to be produced from somewhere. That is always one difficulty of a research institution.

58,531. What control does the Ministry of Agriculture exercise on the station?—Wisely, they concern themselves with principles rather than details; so long as they are satisfied that good work is being done they do not interfere with the detailed running of the place.

58,532. Do you have to submit the budget of the institution to the Ministry?—Yes; we submit each year an estimate of our expenditure and the programme of work we propose to do. At the end of the year we submit an account of what we have done, with a list of the publications. We are open at all times to inspection by the Ministry.

58,533. On what basis do you allocate the needs of the various departments in the station?—Do you mean the funds for the actual running of the department, such as the actual purchase of chemicals and apparatus?

58,534. Yes.—Chemicals and apparatus form a separate account from the salaries and ordinary running expenses. A certain sum is set aside for the whole institute for the purchase of chemicals, apparatus and general appliances. The allocation of that sum is made by a Committee of the Staff Council. All the heads of departments are represented in this Committee, but I do not attend its meetings.

58,535. Do you consider team work in a research institution is essential?—Absolutely.

58,536. When you say team work, do you mean that the different facets of the same problem are approached by various departments?—Yes.

58,537. How do you make the allotments of research work among the various departments? Is that done by the Council or not?—No, that generally grows up. I attach far more importance to the personal and informal development of programmes than I do to any formal arrangements. One has to remember that a good research worker is essentially a Radical. He is a research worker simply because he does not accept the conventional explanation of a thing. He resents official methods of procedure; but if he is faced with a problem and can talk it out, particularly if half a dozen of them are talking it out together, then they will come to some method whereby the necessary co-operation can be carried out. If it is seen that a problem

is partly bacteriological and partly chemical, the bacteriologist and the chemist set about finding a solution if both are satisfied that it is worth doing. It is the Director's business to keep these informal methods on a straight course; unguided the work might become diffuse and incoherent.

58,538. So much for team work in the station. Do you have any links, in your soil investigations, with outside stations or with similar work at Universities?—So far those links have been confined to the field work. The Aberystwyth staff carried out certain field work which we wished to see done: the effect of chlorides as fertiliser under their conditions. So far we have carried out no definite investigations in conjunction with other institutions, except only in regard to methods of mechanical analyses of soil, where it is necessary in the end to get everybody to agree, and where it is desirable, therefore, to bring everybody in at the beginning.

58,539. Taking these field experiments that you carry on in many parts of the country, under whose control are those experiments carried out?—Under our control, controlled always from Rothamsted.

58,540. And financed by you?—The question of finance does not usually arise. Some experiments are very costly, and then money has to be found, such, for instance, as the barley experiments; these are financed by the Institute of Brewing. Other experiments are less costly and the finance has been arranged by the local people who are at least as interested as we are in the result.

58,541. You told us that you are carrying on experiments in Scotland?—Yes.

58,542. Who pays for the experiment there?—The barley experiments are paid for by the Institute of Brewing.

58,543. Are you carrying on any experiments in the agricultural colleges in Scotland?—Yes; we have one potato experiment at Edinburgh, for which they pay.

58,544. But it is under your supervision, and the college follows the plan of the experiment set out by you?—Of the barley experiments, yes. Of the potato experiments the plan was discussed with us, and we agreed to it; but the Edinburgh people are just as interested in the result as we are, and so they are carrying out the experiment.

58,545. Are these trials based on any uniform technique, so that the results may be comparable?—Yes. There are two important kinds of field experiments: those requiring a high order of accuracy and those where a lower order of accuracy is sufficient. The outside experiments are usually, though not always, of a lower order of accuracy than those done here. I say usually, but we have some which are of a very high order of accuracy indeed which are done outside. It depends on the kind of information we want.

58,546. You told us that you conduct trials on the farmers' own land?—Yes.

58,547. For long periods?—Yes. We began this work in the year 1921 in a tentative sort of way. We did much more of it in 1922, and some of the first farms are still in the scheme.

58,548. They send their results to you?—Yes, or we send somebody down to weigh up the crops. One of our workers has just been away weighing hay in Somerset. Usually we try to get the weighing done by the County Organiser, but if he cannot do it we send somebody along.

58,549. That is the link between the county demonstration farms and Rothamsted?—Yes, that, and the lectures which we give, and the visits of the farmers here.

58,550. So that these various farms are the points of contact you have with actual farmers?—Those are also important.

58,551. In addition to the various field experiments conducted by the institution, do you have any farm run on economic lines with a view to working out costs and actual profits?—Not on our own account. We have a

good deal of our land under ordinary farming, but this is not its primary purpose: it is simply resting from experiments. We had until quite recently a farm under our close supervision at Leadon Court, which was run as a pure commercial venture, where we were studying arable dairy farming. That experiment went as far as seemed desirable, and so was discontinued. We may always take up another farm of the kind, but we depend for that on somebody who will furnish the necessary funds, because we cannot run serious risk of losing money owing to the season or to some adverse circumstance; we have not got the necessary resources.

58,552. You stated that some of your trials are financed by brewers. What is the relationship of the station to the manufacturers of fertilisers, or of agricultural implements?—We have no official relationship whatever. We keep clear of all entanglements and all alliances or connections with organisations of producers of agricultural commodities. Where the manufacturers of fertilisers desire to obtain information on certain points which it is within our power to obtain, then we carry out experiments to get that information provided they will put up the full cost of the experiments. The information which we obtain for them may not be used for propaganda purposes. Further, we usually, though not invariably, claim the right of publishing the results, though we do not insist on that claim if a patent or some trade secret or anything of the sort is involved.

58,553. You do receive assistance in that way from commercial enterprises?—Yes.

58,554. When you are carrying on experiments on wheat, how do you come in touch with the millers who are the ultimate consumers?—The millers have a Research Association, and I am a member of its Governing Body. Further, the head of that Association is one of our own people. It is comparatively simple for us to maintain touch with a number of bodies of that sort, because so often we furnish the head or somebody high up in the organisation.

58,555. In the case of the barley experiments the brewers came on the scene?—Yes.

58,556. In the case of the wheat experiments the millers came on the scene?—The machinery is all there should they be needed.

58,557. In the case of potatoes, did the big growers come on the scene?—Yes.

58,558. On page 776 of your note of evidence you say that the senior members of the institution give lectures to farmers. Does that practice interfere with the research work?—No, we take care that it shall not do so. Our guide demonstrator and farm manager can always take any lecture if it were found to interfere with the work of a member of the scientific staff. No heavy burden falls on any particular individual: a number of the scientific staff, including myself, share the work. I attach a great deal of importance to it, because it does bring us in personal touch with the farmer's problems.

58,559. It seems to me there is likely to be an increasing demand for agricultural research workers throughout the Empire. Is it your view that there is a growing interest amongst University graduates to undertake agricultural research?—It is very difficult to answer that question, because the generations of University graduates are so short. You sometimes, in going round a Botanical Department of a Chemical Department and talking to the senior people there, get the impression that many of the best of them would like to go in for agriculture. Then perhaps two years afterwards you could go to that same institution and strike another lot of men to whom agriculture does not appeal so much.

58,560. *Mr. Calvert*: Could you enlighten us as to how the practical economic value of research to the farmer comes in?—Officially, through the body of advisers to the farmers, who are on the spot and know the farmers

and their problems. In addition we adopt the various direct methods described in my Memorandum.

58,561. How does the economic importance to the farmer influence the research workers here and the work they undertake?—Only indirectly. Our purpose is to get the knowledge on which an advisory system can be founded. That knowledge is gained as the opportunity arises, and applied as best we can. You cannot shackle your workers by telling them they must not work at a certain problem, simply because at the moment it happens to have no economic importance. If you have a choice of two problems and it is immaterial whether you do one or the other, you would select the one more closely bearing on practical economic problems, but you would not let that influence your decision too much.

58,562. I gather in England there is a far bigger area under grass than under wheat?—Yes.

58,563. The economic importance of grass land in England, then, is far greater than that of wheat land, as the amount under wheat is not at all comparable in economic importance with that under grass?—The amount of research work done on an agricultural problem cannot at any given moment be directly related to its economic importance, simply because the economic importance fluctuates from year to year, and research has to be on a long period basis: for example, you may have to plan a five-years' experiment: during those five years the economic conditions may have shifted, and a problem, which at the beginning of the period may have been very important, may be of only subordinate importance at the end.

58,564. How do you keep your research worker's nose down the economic lane, because the ultimate end of agricultural research is economic?—No, I should not entirely agree with that.

58,565. The Ministry of Agriculture is not subsidising you to add to the store of pure knowledge but to help English agriculture to become more prosperous?—Yes, that is the purpose, but then there are two ways in which it can be achieved. One is by developing a system of agricultural education and the other is by the solution of the farmers' problems. Agriculture is more likely to be prosperous where there is an alert, well trained rural community, whose education is based on the facts of country life and the general principles underlying farming operations, than where there is an untrained rural community with a set of advisers going round and telling the farmers how to tackle difficulties as they arise. It is our primary purpose to win the knowledge on which the teacher can base his rural education, and which the agricultural expert can use in giving sound advice to the farmer. As a matter of fact, we exceed that purpose and make some applications of our own.

58,566. On the question of the different workers on the scientific and agricultural field, we have in India to consider three classes. There is the agriculturist, who is directly concerned in field work; there is the College staff, engaged on the educational side, and there is the research worker. The problem arises as to whether you should recruit a research worker and expect him to teach, or recruit an educationalist and hope that he will engage in research. What do you say to that?—You cannot expect a research worker to do a great amount of teaching successfuly, because he is probably not a born teacher: it is rather rare for a man to be both a good teacher and a good research worker. There are brilliant exceptions to that rule, but in general you may say that a research worker should do research and some teaching and a teacher should do teaching and some research; but the primary function of the teacher should be to teach and the primary function of the research worker should be to do research.

58,567. You do not think that to search for the dual capacity man is to go on the right lines?—No.

58,568. Assuming you were given a problem of urgent economic importance, such as the almost complete damming up of English rivers by some weed, would that research work be undertaken by any of the existing institutions or would you create for that some purely *ad hoc* body of men separate from the institutions?—Do you mean supposing the problem was presented to us at Rothamsted or that it arose in this country?

58,569. Supposing you are advising us, would you like the existing Institution to undertake that general research work or would you have a completely separate *ad hoc* body of workers to do it?—For a specific object of that sort we should first make a survey of the problem and then see who are the most appropriate members of the staff to deal with it. If it is of sufficient importance we should appoint special assistants for the work. You cannot lay down rigid rules of procedure. The research institution must have considerable elasticity, so that the appropriate action, whatever it is, can be taken.

58,570. You really depute an officer to survey the problem, and then try and bring the problem back to the laboratory?—As a general course, but I should prefer not to generalise but simply survey the problem and decide on the best course of action, whatever it may be, and not be tied by any official regulations or procedure.

58,571. *Mr. Kumat*: As to the composition of your Governing Body, would you kindly amplify your statement as to the authority which sets up the Governing Body. Is it appointed for a definite number of years, or for a long period, and has the Ministry of Agriculture the right of nominating a certain number of people on the Governing Body?—The Governing Body is set up under the terms of a Trust Deed, which was established by Sir John Lawes in 1889, some years before he died. It is there laid down that the Governing Body shall be composed of eight members, four nominated by the Royal Society, two by the Royal Agricultural Society, one by the Chemical Society, and one by the Linnæan Society. A Trust Deed in England is a very sacred document, and there is no way of altering its terms short of an Act of Parliament, a very expensive matter. The result is that the Ministry of Agriculture has no representative on our Governing Body and no power of putting one on unless they could persuade one of these Societies to select somebody they suggested. By the Trust Deed the members are nominated for five years. In practice they are always re-elected, so that we have one member who has been on the Governing Body for the whole 38 years that it has been in existence. There is a clause that if a member not attending any meeting for two years automatically goes off the Body. That has only come into operation once ever since I have known anything about the Institution.

58,572. How are these representatives chosen with reference to science?—The Chemical Society appoint a distinguished chemist, the Linnæan Society a distinguished botanist, and the Royal Society at least three distinguished men of science, and from time to time others distinguished in other activities. They appointed Lord Clinton, the present Chairman, a very well-known agriculturist with wide experience in the handling of practical problems and with full knowledge of the organisation of research work inasmuch as he is also Chairman of the Forestry Commission.

58,573. When you send up your schemes to the Development Commission and ask for funds, is it the Governing Body which ultimately sends up the scheme, or the Director?—The scheme is drawn up here. It is submitted to the Governing Body, and, when approved by them, is sent up countersigned by the Treasurer of the Institution. The Development Commission provide the capital for extensions but give no annual grant direct to us. They make a relatively large grant to the Ministry of Agriculture who then allocate the sum between the institutions. For our annual grant we therefore apply to the Ministry of Agriculture and not to the Development Commission.

58,574. But the Development Commission requires that the scheme should come with the approval of the Governing Body?—For capital extensions, yes.

58,575. You said you depended upon annual budgets?—Yes.

58,576. Do you depend for your continuity of research on those annual budgets?—It is always understood (I do not know how far it is officially agreed, but Sir Thomas could tell us that) that an annual grant made by the Ministry of Agriculture will probably continue. We take that as a good enough basis for continuity of work: the Ministry never have refused to renew our grant, and I cannot imagine that they ever would.

58,577. The Institute thus depends upon an unwritten convention for the continuity of research rather than any regulation?—There is nothing in writing with us, but what there may be between the Ministry of Agriculture and the Development Commission I am not in a position to say. It has to be remembered that the Ministry of Agriculture and the Development Commission are both entirely sympathetic to our work, and would always do whatever they could to provide the necessary funds.

58,578. You have said that the senior members of the staff give lectures to farmers?—Yes.

58,579. And you have added that you, the Director, come in direct contact with the farmers?—Yes.

58,580. Are those farmers typical representatives of the brewers or the millers, or commercial farmers, or are they ordinary farmers?—They are good, ordinary, farmers. Generally the men that we meet are the good farmers, not necessarily always the big farmers or the rich farmers, but the keen men. Some of our correspondents are quite small men, but they are always keen on farming and anxious to develop their farms and improve their conditions as much as they can. They are intelligent people.

58,581. Is it a great advantage that a highly scientific man such as the Director of the Institute should come in touch with the ordinary unsophisticated, simple, farmer?—I think so. I always enjoy a talk with farmers, however small their farms, and with farm labourers. I was in a little village one Sunday morning, and somebody collected a lot of farm labourers and I had a talk with them about the soil. They were most interested, and we went on for two or three hours.

58,582. That system has a great advantage?—I think it has.

58,583. You said that the type of Indian students who came here showed a fairly good capacity in research?—Yes, the individuals that come to Rothamsted.

58,584. After two or three years training here do you think they would be capable of being not only ordinary research workers, but even heads of their respective departments when they go back to their research institutes in India?—Some of them.

58,585. You think ultimately they would become capable of being heads of departments?—Yes. I should not say all, but some of them. Research is like science itself: there is no division of nations or races. Some individuals can do it, and some cannot.

58,586. Before the Development Commission came into existence, what disadvantage did this institute feel, if any?—The very serious disadvantage that we had but little money, and so only a small staff of four or five, all of whom were underpaid. Our appliances were inadequate, frequently home made; and in consequence we were unable to work with the degree of the accuracy possible now.

58,587. The staff was strengthened because of the creation of the Development Department?—Yes. It was they who furnished the necessary income.

We now obtain from the Ministry of Agriculture some £27,000 annually. Obviously we can do far more with an amount of that sort than in the old days when we had only our endowment, which brought us in something less than £3,000 a year.

58,588. *Professor Gangulee*: You receive capital grants also, for extension work?—We receive capital grants for the erection of new buildings and for specific purposes.

58,589. *Dr. Hyder*: You would not like to be put entirely on the Vote of the Ministry of Agriculture so that Rothamsted became a Government Institute altogether?—No, we should not like that at all; we value our independence very highly. That is no reflection on the Ministry, but I do not think it desirable that a research institute should be entirely dependent on a Government Department.

58,590. Would you apply that to the case of research institutes in India?—I should apply it as a general rule, unless there was some very special reason to the contrary. I think that a research institute is far better governed by some body such as ours, which is nominated mainly by scientific societies and partially also by agricultural societies, with, if you like, Government representatives as well. Some degree of elasticity is absolutely essential to research institutions, and it is very difficult to get this if you are part of a Government department.

58,591. *Sir Thomas Middleton*: Would you consider a Governing Body of from ten to twelve members, with an Executive Committee, an unwieldy body to control a research institution?—No. I think the general principle should be that the Governing Body should deal with principles rather than with details; these should be settled in the institution itself, by the Director and the staff.

58,592. You stated that your own Council is mainly advisory, a body which debates and discusses questions?—Which Council?

58,593. I was thinking of the Council which Professor Gangulee referred to?—The Staff Council?

58,594. Yes. You expressed a preference for a Council rather than a Governing Body in order to afford provincial representation?—That is a different Council. The Staff Council deals with domestic affairs within the institution. The Council to which I thought Professor Gangulee was referring was some external body. I have sometimes thought it would be desirable to have a kind of advisory council on which we could get representation of the farmers from different parts of the country so as to ensure that we are doing all we can to keep in touch with the farmers' point of view and to ensure that the farmers' problems will be brought to our notice. It is, however, difficult to get a body of the right sort together.

58,595. It would be a little difficult even in England where you are in close touch with farmers and their representatives in every county?—Yes.

58,596. What would happen if you were to try to get an advisory council from such distances as Berlin, Paris, or Rome, to meet at intervals for discussion?—It might easily happen that the labour was not worth while. The difficulty that I have always been up against here when I have tried to plan a Council of that sort, is to bring into it the farmer who is really faced with the problems and to keep out the gentleman who sits in his club in London and has views as to how farming should be conducted.

(Dr. Keen, who attended with Sir John Russell, was then separately examined, Sir John Russell remaining.)

Sir John Russell.

Dr. B. A. KEEN, D.Sc., F.Inst.P.,
Assistant Director, Rothamsted Experimental Station.

Oral Evidence.

58,597. *The Chairman*: You are Assistant Director and head of the Soil Physics Department?—Yes.

58,598. Would you like to say anything about Sir John Russell's note? I understand it is not a joint note?—No; it was written by Sir John, but I had an opportunity of discussing it with him.

58,599. Is there any matter you would like to amplify?—There is one point I would like to emphasise in connection with Indian research workers who come to Rothamsted. We have had experience of Indian students who have gone back to do agricultural research, and others who have gone back to do technical work. There is no question in my own mind that the former should begin here after about a year's post-graduate work. On the other hand, for the technical man it is very much more important that he should have acquired his technical knowledge before he comes over here. We find it is a great advantage to have research workers here for two or three years, not only because it is mutually beneficial, but also because, if they come over for that period of time, they are able to work for one of the higher degrees of an English University. The University of London and the University of Cambridge (we have associations with both those Universities) examine the standard of training of a man before they will accept him as a candidate for a higher degree, so that in this way we get a kind of automatic elimination of the poorly trained men. Beyond this I have nothing to add to what Sir John has said, with which I agree, with the exception that I perhaps am more optimistic about the direct application to agriculture of the broad principles of soil classifications to which Sir Thomas Middleton referred.

Sir John Russell: I want to be quite clear about that. I did not wish to say that I did not think they would not be useful, but simply that I did not think they would give the agriculturist all the information he wants.

58,600. *The Chairman*: You know there is a group of problems in connection with damage to soil due to waterlogging consequent upon irrigation, and that those problems are of growing importance in India. Have you considered those matters yourself?—I have little direct field experience of irrigation, but the fundamental problems form, of course, a branch of my special subject.

58,601. Can you give us any guidance as to how far the scientific problems touching these questions are of a nature which could be, or ought to be, dealt with by a central institution, or whether they are better dealt with as problems of a local nature at institutions controlled by the Provinces?—In my view I think the general problem is one that can only be attacked properly in a central institution. I can quite see (and I would support the suggestion) that certain special side lines of the main problem might occasionally have to be examined on the spot. But, in my opinion, that could not satisfactorily be done unless the central institution was already working on the main problems since the sub-stations would need this guidance in their own programme of work.

58,602. It may be that, in India, the central Institution should be central in the sense of central to one Province, and should have sub-stations within that Province?—Yes, central, but not necessarily central to the whole Continent.

58,603. But central in the sense of dealing with the fundamental aspects of the problem?—Certainly.

58,604. Are there many men available in the world market capable of undertaking research of such complexity and importance as that to which I have referred?—That is a difficult question.

58,605. But it is a very important one?—It is a very important one. I can only refer you to what Sir John answered in the wider connection. I think the men can be found, but I should not like to have to specify any particular people by name.

58,606. I do not suggest that. I merely wish you to emphasise, if you are of that opinion, that the shortage is a serious one, and that calibre is everything, and that every endeavour must be made to get the very best research workers. There is a notion abroad in some quarters that if you get a secondary class of research worker and pay him rather less, you may not get quite as much, but you will get something worth having. That is not always true, is it?—No. That view is not unknown in our own country; but it has been changed very much in the last few years.

58,607. *Sir Thomas Middleton*: You emphasise the necessity of a central institution for the investigation of irrigation problems. Have you formed any opinion as to the size of the institution, and the number of members of staff that would be wanted to initiate the work? Would you start with a single soil physicist, or would you want a team of a dozen men?—A team is highly desirable, but it is not much use starting with soil physicists alone. You have to have chemists and physical chemists, if you are going to tackle the soil problems in irrigation, to say nothing of the plant side or the chemical side.

58,608. In each of the three departments you have mentioned, what size of staff do you visualise as being required at the central institution which is to do work of fundamental importance?—I ought first to mention that in addition to physical chemists and the physicists you must have soil micro-biologists, and you thus arrive at an organisation such as we have at Rothamsted. For fundamental problems it is my view that an institution which controls about fifty people gives the maximum of efficiency. One has seen bigger institutions in America, and elsewhere, where all personal contact is lost. I do not think you can go much beyond the limit of fifty.

58,609. We are not thinking of the maximum number, but the minimum at the moment?—That depends entirely on the funds, does it not?

58,610. Yes, but when you advise a central institution, what I want to get is the minimum staff that would be necessary to do such work as you have in view?—On the assumption that the central institution was dealing only with irrigation?

58,611. With waterlogging, and related questions?—And no other questions of agricultural science?

58,612. No. I do not think you would get any substantial progress under half-a-dozen to a dozen to begin with. To visualise the problem, the best thing is to give a comparison with the Rubber Research Association of Malay. This Research Association is an entirely fresh organisation comparable in its beginnings with what you are postulating. They have appointed, in the first instance, a Director and about half-a-dozen heads of departments. These people having settled the broad outlines of their programme are now building up their assistant staff; and they contemplate a staff of about twenty to thirty to deal with this one problem of the growing of rubber. I think that is the kind of minimum figure on which an institution can produce results within a reasonable time.

58,613. *Professor Gangulee*: In your memorandum prepared for the Empire Marketing Board,* you have laid emphasis on soil research with a special reference to irrigation. You have also stated, there, the number of problems which should be studied. Is it your view that such fundamental and economic investigations may be pursued efficiently in a central

* " Irrigation in the Empire " Memorandum and Questionnaire, not printed.

research station?—Do you mean both from the fundamental research and the economic view-points in a central institution?

58,614. Yes?—I see no real reason why that should not be possible; but I do not know that the experiment has been tried in any particular branch of work. You are contemplating welding it into one institution under one direction?

58,615. Under one administrative head?—I am not happy about the idea. Personally I can see very many grounds for friction, some of which were emphasised in connection with practical agriculture by Members of your Commission. I can see nothing that could not be gained by the kind of co-operation which Sir John has mentioned between different types of institutions. I do not think you could weld the two things at this stage.

58,616. You would support the idea of separating fundamental research from its economic applications?—Yes.

58,617 Research workers are not manufactured by mass production. The difficulty is if you had a number of sub-stations carrying on research, you could not supply them with an adequate staff?—That is one difficulty.

58,618. If you want to make a beginning in this direction, you would recommend centralising research on irrigation problems?—I would prefer a unified beginning rather than a diffuse one at a number of separate points, because of the danger of overlapping; and, secondly, the danger of missing out important things. It is rather a wasteful method in my opinion.

58,619. Do you attach much importance to exhaustive studies of soil and climatic conditions prior to the undertaking of an irrigation project in a zone?—They must be done, but there are so many practical problems in connection with irrigation scientific attack which could be undertaken, that there is no reason to wait for the soil and climatic aspects. It will be wanted, but not as an essential preliminary.

58,620. Sir John has laid great emphasis on soil surveys. Would you be prepared to say that soil surveys are of fundamental importance where agricultural practices depend largely on irrigation?—A detailed soil survey, certainly.

58,621. You have just returned from the International Soils Congress?—Yes.

58,622. Was there any representative of the Government of India there?—There was one representative of the Government of India who happened to be working at the Cornell University. I cannot say whether he was an official representative, but I think not.

58,623. Do you know of any paper submitted before this Congress by research workers of India?—One or two were submitted in abstract form, by workers who were hoping to attend. Whether those papers will be put forward in a final form I do not know. That is in the hands of the American Organising Committee.

58,624. You sent one of your men to the Sudan?—Yes.

58,625. Was that at the request of the Sudan Government or of the Empire Cotton Corporation?—Sir John will give you the actual details of the arrangements made. He went from the Soil Physics Department to study the problem on the spot, and brought back details on which he is now working.

Sir John Russell: It was done partly by the Sudan Government and partly by the Empire Cotton Corporation. The Sudan Government provided the transport, the Empire Cotton Corporation provided the subsistence. It was a division in that way.

(*The witness withdrew.*)

(*The Commission adjourned until Monday, the 24th October, at Karachi.*)

APPENDIX 1.

(*See* page 211.)

Statement comparing the area under various crops in India in thousand acres.

——	1903-4.	1913-14.	1923-24.
Rice	69,597	76,908	77,200
Wheat	23,613	22,685	24,294
Other Food-grains	93,668	91,980	95,505
Total Food-grains ...	186,878	191,573	196,999
Linseed	3,234	2,269	2,645
Rape and Mustard Seed ...	3,431	4,083	3,655
Other Oilseeds	7,881	8,306	7,962
Total Oilseeds	14,546	14,658	14,262
Cotton	11,896	15,844	15,385
Jute	2 504	3,136	2,329
Other Fibres	669	915	703
Total Fibres	15,069	19,895	18,417
Fodder Crops	3,831	5,910	8,764
Sugarcane...	2,417	2,708	3,045
Tobacco	976	1,002	1,025
Tea	506	572	713
Coffee, Indigo and Opium ...	1,484	425	415
Total Miscellaneous ...	9,214	10,617	13,962
Grand Total Area Cultivated ...	225,707	236,743	243,640

APPEN

(*See*

Schedule showing different classes of agricultural

O. B. Values of Agricultural Produce of India.

Commodity.	Per.	Pre-War Average.	1922–23.	1923–24.	1924–25.
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Food-grains—					
Rice	Cwt.	5 5 8	8 4 11	7 15 3	8 2 2
Wheat	,,	5 5 5	7 13 0	7 2 4	7 11 9
Wheat Flour ...	,,	7 14 8	12 15 11	9 15 6	10 12 11
Barley	,,	4 4 2	6 2 0	5 3 11	5 12 5
Pulse	,,	4 1 4	6 12 11	5 9 4	5 14 7
Seeds, Oils and Oilcake.					
Seeds—					
Castor	,,	7 5 2	10 15 5	13 5 7	15 1 11
Copra	,,	17 15 7	18 1 11	20 11 9	21 12 8
Cotton	,,	3 12 0	5 6 2	5 11 4	5 14 10
Groundnut ...	,,	8 5 1	14 2 5	13 15 9	14 2 11
Linseed	,,	10 8 8	13 6 6	13 0 9	13 2 1
Rapeseed	,,	7 9 8	11 1 3	10 14 9	11 9 3
Sesamum	,,	10 6 5	14 15 5	15 0 5	15 7 9
Oils—					
Castor	Gal.	1 5 10	2 6 10	2 11 2	2 15 7
Coconut	,,	1 12 8	2 6 9	2 8 3	2 8 3
Oilcake	Cwt.	3 12 8	5 11 2	5 7 3	5 10 4
Manures—					
Bones	Ton.	69 0 9	107 6 7	119 14 5	115 8 2
Textiles, Jute—					
Jute, Raw	,,	290 7 4	380 12 7	303 0 11	418 0 1
Gunny Bags ...	No.	0 4 5	0 7 5	0 7 1	0 8 9
Gunny Cloth ...	Yd.	0 1 9	0 3 1	0 2 9	0 3 1
Hemp, Raw ...	Cwt.	13 12 0	14 12 1	16 10 6	25 13 7
Spices—					
Pepper	Lb.	0 4 8	0 4 5	0 4 5	0 4 11
Chillies	,,	0 2 4	0 4 4	0 3 10	0 3 10
Tobacco—					
Unmanufactured ...	,,	0 1 10	0 5 4	0 4 8	0 4 5
Coffee	Cwt.	54 0 4	73 1 4	72 2 2	86 4 6
Indigo	,,	194 6 6	373 10 4	298 14 7	330 3 10
Rubber, Raw	,,	36 15 5	64 15 5	83 1 3	88 14 8

DIX 2.
page 213.)
produce exported from India.

Exports (Average of 1922-23, 1923-24, 1924-25).		Proposed.		Cess.	Proceeds of cess.
Commodity.	Quantity.				
		Rs. a. p.		Per.	Rs.
Food-grains	Tons. 3,429,000	0 2 0		Cwt.	85,72,600
Seeds	Tons. 1,253,000	0 3 0		,,	46,98,800
Veg. Oils	Gallons. 1,659,000	0 1 0		Gal.	1,03,700
Oilcake	Tons. 175,000	0 2 0		Cwt.	4,37,500
Manures	Tons. 114,000	1 0 0		Ton.	1,14,000
Jute and Jute goods ...	—	One-twentieth of existing duty.			17,39,000
Hemp	Cwt. 513,000	0 4 0		Cwt.	1,28,250
Spices	Cwt. 307,000	0 4 0		,,	76,750
Tobacco leaf	Lbs. 32,569,000	0 4 0		,,	72,700
Coffee	Cwt. 210,000	1 0 0		,,	2,10,000
Indigo	Cwt. 5,000	2 0 0		,,	10,000
Rubber	Lbs. 15,311,000	1 0 0		,,	1,36,700
Total	—	—		—	1,63,00,000

APPENDIX 3.

NOTE BY Mr. HARALD FABER, AGRICULTURAL ADVISER TO THE DANISH LEGATION.

See pages 104 to 124.

Primary Schools in Rural Denmark.

Introduction.

When I gave evidence on the 13th of June, 1927, before the Royal Commission on Agriculture in India I found that more information was desired about the primary schools in rural Denmark than I was prepared to and able to give at the time, and that the question was looked upon as of some importance. It was mentioned that, with the exception of one of the States in America, Denmark was the only country in which the farmers did not object to the educational system because in Denmark almost alone of all countries did the primary schools in rural districts avoid depriving the children of interest in agriculture and thereby drawing them away to other pursuits, a fact which it seemingly has been found very difficult to explain. I have since been asked to supply the information I gave at the hearing, and I have therefore collected the following data, which I hope may throw some more light on this very interesting question on the system of primary schools in the rural districts in Denmark and explain what has been looked upon as almost a riddle.

The earliest Laws about Schools.

As early as 1683, when the Danish King, Christian V, gave his celebrated "Danish Law," it was made compulsory for all children in the towns to go to school from their sixth year (Book 3, chapter 18, section 7). King Frederick IV in 1721 had 240 schools built in country districts, and several of these buildings are still in existence. The first general Law about schools came in 1739, when King Christian VI made it compulsory for all parishes in country districts to build schools for those children who were not taught at home. The cost of keeping these schools were partly defrayed by taxes and the parents had to pay the teachers for the children attending school. By an investigation about the year 1784 it was found that children were taught either in school buildings or by itinerant teachers, in all parishes, but in many cases the children lived too far away from the schools, the school buildings were often very inferior and the teachers in many cases ignorant and in other respects unsuitable.

With the many other reforms carried or prepared during the latter part of the eighteenth century that of the schools was prominent, and on the 22nd May, 1789, a Royal Commission was appointed to investigate what ought to be done to improve the system of primary education. Already in 1791 the first Seminary, or college for the education of a better class of teachers, was opening in Copenhagen in a Royal castle, Blaagaard, and later on others have been erected, partly by the State, partly privately. In 1799 the Royal Commission submitted their Report, which recommended that all children should be taught free in proper schools, but with the very important condition that necessary precautions should be taken to avoid depriving the peasants of the help which the children were accustomed to give in carrying on the work on the farms. There is no doubt that this important provision was proposed, not in the interest of the children, but rather as a restriction of what was considered as due to the children and proposed in order to make the compulsory schooling of the children less burdensome and objectionable from the point of view of the farmers. A similar consideration tending to

confirm the opinion that the schools should not draw the children of peasants away from the peasantry found expression during a deliberation of the Royal Commission concerning the seminaries, when in 1800 it was declared that "the school teachers should be educated to be sensible peasants among the peasants."

This tender regard for the convenience of the peasants (farmers) has resulted in certain provisions in the school Laws up to the present time, and it is evidently these provisions which, together with the influence the farmers had and still have in the practical working of the schools, as will be explained presently, which have resulted in a system of primary schools in rural Denmark, which has given Denmark the almost unique position of having avoided drawing the children and the interest of the children away from agriculture while still giving them a good primary education.

The Royal Decree of 1814.

As a result of the work of the Royal Commission of 1789 came the Royal Decree of 29th July, 1814. As a matter of fact, two decrees emanated that day, one dealing with the schools in the towns and one with the schools in the country districts. I shall confine myself to the latter.

All children should be taught from their seventh to their fourteenth year. They might enter the school a year earlier. The children were to be examined by the teacher twice every year in the presence of the school-board and they could not leave the school before they had proved, by the final examination, that they had acquired the necessary proficiency in the different subjects. Children might be taught at home when the school-board satisfied itself that they were taught properly by a competent teacher. In other words, the compulsory tuition in schools, as prescribed in the Law of 1739, was replaced by compulsory education in schools or at home, but in the latter case under some supervision. Boys and girls were taught together in these schools, and are so to the present day.

In each parish should be a *school-board* elected by the parish council, and they should provide so many schools that the children had no greater distance to go to the school than one mile, and that a teacher had no more children than he could properly manage and teach. The duty of the teacher was not restricted to merely teaching the children. He had to see that no children with contagious rash or other illness came to the school and should admonish the parents to have the children properly cared for and cured, and when the parents omitted to do so they could be punished by fines. The children of poor parents were treated at the expense of the poor fund. The teacher must also see that the children were kept clean, as otherwise the parents could be fined. He should teach the children Religion, Writing, Arithmetic and Reading, including the History and Geography of the country. Also Singing and Gymnastics were to be taught and the necessary place and apparatuses for Gymnastics were to be provided by the school fund. The teacher should be a graduate from a seminary as far as possible. He must not punish the children, but should encourage the clever and well-behaved.

The children were examined twice a year in the presence of the school board, and no child could leave the school unless it was found to have acquired the necessary efficiency. For those children who had left school and had been confirmed, but who wished to extend their knowledge, continuation classes were kept during the winter two days a week in the evening for the boys, in the day time for the girls.

All tuition in the schools was free, including that in the continuation classes.

The teacher, in addition to his salary, had free house and fuel and enough land to keep two cows and six sheep.

To supervise the schools in the different parishes in the districts there was to be in each district ("Amt") a school committee, consisting of the district-superintendent (Amtmand, a civil servant appointed by the King) and the dean (Provst, one of the vicars in the district elected for that duty). Also the Bishops should, as hitherto, supervise the schools in their respective districts, and annually send reports to the King's Department ("Cancelli").

The development of the educational system was so far carried on by the absolute kings through their officers. In 1849, Denmark had its free Constitution, and the Ministers of Education (or of Public Worship), with the legislative Rigsdag, took over the duties of providing for the education of the children. The system of 1814 has been gradually developed and modified without any alteration of the fundamental principles.

After 1849.

The Constitution of 1849, in section 90, and all later Constitutions contain the provision that children of parents who cannot afford to pay for their education shall be educated free in the public schools. Likewise is the principle from 1814 maintained, that parents who provide at home an education equal to that of the school shall be under no obligation to send their children to these schools. From 1855 and up to the present time a series of Laws have been enacted affecting primary Schools in rural districts.

Characteristic of the system is the great extent of decentralisation. It is the local school boards, one in each parish, who have the management of the school or schools in the parish. They have to provide the necessary number of schools and accommodation for the necessary number of classes and teachers.

In the early part of the century, when both the State and the population were very poor, a teacher could have as many as 100 pupils to teach, that is, in two classes, 50 children in each. By the Law of 1899 this was reduced to 37 pupils in each class, 74 in all. This necessitated the building of a number of new schools. The expenses of providing school buildings fall on the parish school board, but in consideration of the many new schools required by the Law, the State gave a considerable grant, mostly in the shape of loans with 4 per cent interest and 2 per cent. sinking fund, so that those loans are now mostly repaid. It is, therefore, now the rule that no more than 35 pupils may be taught in a class. If there are more pupils in a school than can be taught by one teacher a preparatory class or classes must be provided for the smaller children, with a lady teacher. When the number of pupils is further increased more classes must be provided for the elder children with an additional teacher for each class, or else a new school must be built.

In case children are absent from school without legitimate cause the parents are fined, 1½d. per day per child. If a child is continually absent more than a month the fine is increased to 3d., 6d. and 1s. per day for the second, third or fourth month. If these fines are not paid the parent may be imprisoned, which, however, is hardly ever necessary.

The subjects taught in the preparatory classes are Danish reading and writing, arithmetic, singing of songs, nursery rhymes and hymns, history of the Bible, Danish history and geography; and for the girls, sewing, knitting and so on. To the tuition in Danish in the upper classes must be given 287 lessons (of one hour each), and general history and geography are taught. The boys in the upper classes have also lessons in gymnastics. Additional tuition can be given in botany and zoology, also Sløjd (wood carving, carpentry and so on) for the boys, and gymnastics for the girls. When a teacher can manage to teach the children the required amount and finds time to take up other subjects, say physics or any other subject in

which he may be interested, he can do so with the consent of the school board. For the children of poor parents all books and other school requisites are provided free by the parish council.

The Law provides that the schools must be open during 41 weeks in the year. In the rural schools the pupils in every class must be taught 18 hours every week, but lessons in gymnastics and sewing and so on are not comprised in these 18 hours but given after regular school hours. It is in the carrying out of this stipulation of 18 hours a week that the effect of the decentralisation and the influence of the local agricultural interest in the management of the rural schools are felt in a manner that give these schools a character of their own. The recommendation of the Royal Commission of 1789, that the farmers must not be deprived more than necessary of the help which they were accustomed to have by the children assisting in the farm work, is followed up to the present time, but it has had the further important effect which most likely was never intended, nor even expected, by the Statesmen of the eighteenth century, that the children, besides being very well and effectively taught in the school, have time left for taking part in practical farm work, thereby gaining both experience and interest therein and, furthermore, living a healthy and active life in the open air, which practice has shown makes them all the better prepared for and keener to absorb the tuition offered in the schools.

These 18 hours a week can be allotted so that the children have three hours a day for six days, and there are, I believe, for instance, in East Jutland, parishes where the local school boards have arranged the school attendance in that way. A teacher can there have one class in the morning, another in the afternoon, and the children have part of the day free. But much more common is an arrangement by which the children attend school for six hours every other day. This may perhaps be considered the normal for the islands. One teacher can, also under that arrangement, teach two classes, one one day, the other the next day, and so on. It is also sometimes so arranged that the big children go to school four days during winter and two days during summer, while the smaller children attend two days during the winter months and four days during the summer months.

A different arrangement is the so-called West Jutland school system. According to that, all children attend school for 6 hours every day from November to May, but from May to November the attendance is different, according to the age of the children.

The big boys are free from school work or attend only one day. The younger children attend two to, perhaps, four days. It will be noticed that by this system the total number of lessons required are given during the winter months, and that, therefore, the children have more lessons than by other systems. Also that a larger staff of teachers are required during winter when, therefore, extra teachers, mostly ladies for the small children, are employed. The parents in these districts, which comprise some of the poorest soil and the hardest climate in Denmark, are so keen on this subject that they willingly pay the extra school taxes in order to keep the older children to help with the work during the summer months. And the children are so keen to learn when they return to school in November that they more than make up for lost time. By an investigation carried on by the Ministry of Education, when papers in arithmetic and Danish composition were set to an equal number of pupils of the same age from schools in town and country and of the different systems in vogue, it was found that the pupils under the West Jutland system came off best of all and were equalled only by some from a few of the town schools. During the practical work in summer the boys are not only gradually trained in farm work, but they learn to understand the necessity and the blessing of working for the wellbeing of the family. And they learn many a useful lesson by working together with their parents and others. During later years several men in Denmark have worked themselves up to prominent

positions from rural schools under this system, such as one Danish Prime Minister, several Professors at the University or the Royal College of Agriculture, Copenhagen, the present Minister of Education, and others. One of these University Professors in his old age implored the Minister of Education to do all he could to preserve this West Jutland School System.

These many different schemes indicate clearly the influence of the local boards or, it might be said, of the parents, and help to explain why and how the system of primary schools in rural Denmark has been adapted to satisfy locally the requirements of the farming class.

The local school boards examine the children twice a year, and the children of 14 years are examined in order to see whether they have acquired sufficient knowledge and particularly sufficient ability in reading Danish and expressing themselves verbally and in writing so that they can leave school. Backward children are kept a year or more. The school boards arrange with the teachers, who desire it, to keep evening classes during the winter months for those children who have left school but who wish to improve themselves. The attendance is voluntary, the tuition is free, but the teachers are paid for the extra work.

In the local rural School Board the vicar of the parish is *ex officio* chairman. With him are two or most often four members, elected by the parish Council. When there are four elected members, two of these must be elected from outside the parish Council and at least two of the four must be *patres familiæ* or widows with children attending school. All members give their services free. These school boards draw up a school system for the parish, which must be approved by the Minister of Education, and whereby is decided the number of schools, number of teachers and their salaries. The board also prepare a scheme of tuition, whether boys or girls are to be taught together—as they are practically in all rural schools—the number of classes, the subjects to be taught and number of hours for each subject. This scheme must be approved by the *school committee* of the district (Provsti), consisting of the district superintendent (Amtmand), the dean (Provst), and one member elected by the district council (Amtsraad) from amongst its members.

By the Law of 1856 a School Council was established for each district (Amt), with the Amtmand as chairman *ex officio*, and comprising all the members of the District Council and representatives for all the towns in the district. This School Council have the supervision of all schools in the district, both in rural parishes and in the towns. They manage the School Fund for the district, the chief income of which is the school rate which the School Council levy on all inhabitants in rural and urban districts. The local school boards pay part of the salary of the teachers and the School Fund pays part of certain additional payments to the teachers and the pensions of superannuated teachers. The local school boards defray all expenses for new schools, upkeep of all schools, the furnishing of these with furniture and school materials. The State pay part of the salaries, part of the pensions and various other expenses. The total expenditure to teachers' salaries has been increased during later years very considerably, and may be roughly estimated at about £1,200,000 for the local authorities and £1,300,000 for the State, besides which the State pays £260,000 towards pensions and other expenses. Furthermore, the State pays for the State Seminaries for teachers.

The teachers must be graduates of a seminary for the education of teachers. There are 7 State seminaries and 12 private Seminaries authorised by the Minister of Education. In 1925 171 teachers, male and female, graduated from the State seminaries and 339 from the private seminaries. A large proportion of the teachers is drawn from the farming population, and they are therefore in full sympathy with the farming

interest. There is a close and healthy co-operation between the teachers and the parents of the pupils, many of whom are farmers and peasants.

Applications for an appointment as teacher must be sent to the parish council, and they select three of the applicants to be submitted to the authority who has the power of appointment. In many cases this authority is the Bishop, particularly where the teacher also acts as sexton and takes part in the work of the Church, divine services, baptisms, weddings and burials, as leader of the singing in Church and so on. Otherwise the appointment is in the hands of the school committee of the district. In case of disagreement between the local board and the appointing authority, the appointment is made by the Minister of Education. Besides his salary and various additions, the teacher has free house for himself and family, free fuel and a garden of about one-sixth of an acre.

The Minister of Education appoints an Inspector, who visits the schools and inquires into the work done. Generally speaking, the Minister interferes very little in the management or working of the schools when there is no special cause for him to do so. But the Minister is kept fully informed by reports from the local boards, giving particulars of number and qualifications of the teachers, number of classes, which subjects are taught, the opinion of the board on the efficiency of the work done, number of children in each class, how many children taught in private schools in the parish, or at home, how many days and hours for each class, how many absentees, and how many fines imposed and whether paid or otherwise disposed of, about evening classes and so on.

The total number of children in schools in Denmark in the year 1924 was as follows:—

In State Schools, 10,397.
In Board Schools, 438,154 in rural districts and towns.
In Private Schools, 51,839 in rural districts and towns.

Besides these, 1,146 children were taught in their homes.

There were 34 State Schools, 631 Private Schools, and 3,834 Board Schools, with 7,446 male and 4,759 female teachers.

SUPPLEMENTARY NOTE BY MR. EDWARD A. FOLEY.

(*See pages 733 to 746.*)

The Smith-Lever Act, approved 8th May, 1914 (38 U.S. Statutes at Large, page 372), provides for co-operative agricultural extension work between the agricultural colleges in the several states and the U.S. Department of Agriculture. The law provided $10,000 of Federal funds for each state in support of the work. It provided also an additional amount of $4,100,000 to be allotted to the states in the proportion which the rural population of each state bears to the rural population of the United States, provided that in each state a like amount is made available from state, college, county, local or individual sources to be used for the same purpose as the Federal funds. These appropriations have since been supplemented to some extent. The extension work conducted with Federal and State funds thus provided, according to the wording of the Act, is to be carried on in such a manner as may be agreed upon by the Federal Secretary of Agriculture and the officers of the state agricultural colleges receiving the benefits of the Act.

The Purnell Act " to authorise the more complete endowment of the agricultural experiment stations, and for other purposes," was approved 24th February, 1925. The provisions of this Act are administered by the Office of Experiment Stations of this Department. The Act authorises appropriations for the work of agricultural experiment stations beginning with $20,000 per state in 1926 and increasing this amount until 1930 when an amount of $60,000 per state is authorised for each year thereafter. These funds are to be used in conducting investigations or making experiments bearing directly on the production, manufacture, preparation, use, distribution and marketing of agricultural products, and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches.

With regard to the supervision which this Department exercises over the expenditure of these funds and the character of work done co-operatively under Government funds, it will be noted that these Acts provide that the payment of moneys shall be withheld if the provisions of the statutes are not complied with by the co-operating agency.

The general policy of the Department in carrying on co-operative work is to draw up a co-operative agreement covering each project, which sets forth the problem, the method of procedure, the cost to be met by each of the co-operative agencies, and other data. The leader of the project is usually a joint employee of the Federal Government and of the co-operative agency, it being provided that the person selected shall be mutually acceptable to all parties to the co-operative agreement. This gives the Federal Government supervision over each project undertaken.

The staff of the Department of Agriculture is built up entirely from the lists of eligibles obtained by the Civil Service Commission through open competitive examinations. This Department co-operates with the Civil Service Commission in furnishing a description of the position to be filled and the requirements in education and experience which are necessary in any candidate for the position.

No legal provision has been made for training of employees in the Department. There is, however, a graduate school in connection with the Department which is conducted entirely on a voluntary basis outside of office hours which serves as a training course. In this graduate school classes study various subjects, including the physical sciences and various phases of political economy, statistics, languages, &c. The funds for carrying on the school are derived from fees paid by employees attending the classes.

The scale of wages of employees in the Department is fixed by an Act approved 4th March, 1923, being " an Act to provide for the classification of civilian positions within the District of Columbia and in the field service." This Act provides broad classifications of positions with a scale of rates of compensation under each grade. All positions in the Department are assigned to the proper class and grade of work under this Act.

With regard to the economic surveys, the Bureau's activities cover a large range of subjects. A great deal of information is gathered by the questionnaire method and through the regular reports which are received in the Bureau. The results obtained from this source are supplemented by personal observation and study in the field. In making surveys the organisation of the Division of Crop Estimates is utilised in so far as possible. Questionnaires are distributed by mail and the returns are tabulated by a corps of clerks. These results are analysed and interpreted by trained statisticians and economists, the validity and accuracy of results are checked by various means, and field studies are made in connection with the data obtained by the questionnaires.

INDEX.

(Numbers in brackets refer to pages, others to questions.)

ADAMS, Professor W. G. S., M.A., All Souls' College, Oxford: 53,491-53,543.

AGRICULTURAL INDUSTRIES, Ireland, position *re*, 53,510-11, 53,520-1.

CO-OPERATION, movement in Ireland, 53,503-9.

EDUCATION in agricultural economics, position in Great Britain and Ireland, and importance of, 53,533-43.

WELFARE OF RURAL POPULATION:
- Horace Plunkett Foundation in London, work of, 53,532.
- National Council of Social Service, England, 53,492-502.
- Rural Community Council Movement in England, and work in villages, 53,492-502, 53,512-31, 53,542-3.

Administration:

Agricultural Development Commission, scheme for, *Lindsay* (213), 53,976-82.

Agricultural Provincial Services, opinion *re* recruitment to, *Howard* 53,976-82.

Agricultural Service, Indian, desirability of study leave at Rothamsted, *Russell* 58,501-3.

Board of Agriculture, value of meetings formerly, *Butler* 53,395, 53,352; *Chadwick* 55,869-70.

Civil Service, certain agricultural training in England, proposal, *Barber* (790-1), 58,358-9, 58,385-7.

Financial Commissioners, relationship to Government, *Fagan* 52,681-3, 52,689-94.

Meteorological Department, *see under* Meteorology.

one Minister for agriculture and irrigation, question of, *Gebbie* 56,901-8.

RAILWAYS:
- Enquiry by Committee of Civil Research, *Jones* 52,364.
- Freights:
  - on Fertilisers, handicap of, and proposal *re*, *Speyer* (482), 56,400-1, 56,464-7.
  - on Implements, reduction desirable, *Rowland* 56,153.
- Handling of fertilisers, criticism and need for better facilities, *Speyer* (482).

Recruitment from Universities, etc., in Great Britain not likely unless appointments permanent, *Shearer*, 54,194-8.

Research, *see that title.*

Rural Development, Departments of, scheme for, *Howard* (184-5), 53,550-3, 53,602-3.

Transport, improvement of, to main ports needed, *Rowland* (451).

Agricultural Department:

Control of well irrigation by, advocated, *Gebbie*, *Ward* 56,872-4.

Co-ordination of functions of other departments and, question of, *Keatinge* 56,955-7, 57,052-4.

DIRECTORS OF AGRICULTURE:
- Civil or technical, question of, *Keatinge* 57,049-51.
- Control of Civil Veterinary Department by, *see under* Veterinary.
- Relief from administrative work, question of means of, *Orr* 53,239-42.

increased Expenditure needed, *Fagan* (43), 52,583.

Punjab, establishment of, probably a good financial investment, *Fagan* 52,633-40.

Recruitment in England, possibilities, *Wood*, *Engledow* (678).

Agricultural Department—*contd.*
Relations with Irrigation Department, *Gebbie*, *Ward* 56,820-1, 56,899-900; Keatinge 56,951-4.
Training of recruits for, in Agricultural College in India and subsequently in England, proposal, *Shearer* 54,266-8.

Agricultural Departments in England, Scotland and Ireland, central controlling body not desirable, *Floud* 52,251-5.

Agricultural Engineers' Association:
Business in India, method of carrying on, *Rowland* 56,134-8.
Evidence on behalf of, *see* Rowland, G. E. (446-451), 56,131-56,319.

Agricultural and General Engineers, Ltd.:
Business in India, method of carrying on, *Rowland* (447).
Evidence on behalf of, *see* Rowland, G. E. (446-451), 56,131-56,319.
Firms controlled by, *Rowland* (446-7).

Agricultural Indebtedness:
Causes, *Fagan* (46), (47-8), (53-4).
Credit, sources of, *Fagan* (54).
Increase, *Fagan* (54).
Lien on land should be prohibited, *Rowland* (450).
Means for lightening burden of debt, *Fagan* (54-5).
MONEYLENDERS:
in Egypt, *Shearer* 54,010-2, 54,025-7.
Evils of system, *Fagan* (48).
Keeping of accounts by, proposal, *Fagan* (55).
Rates of interest charged, *Speyer* (482).
MORTGAGE AND SALE:
in Denmark, *Faber* 52,982-9.
Restriction of right, considerations *re*, *Fagan* (55).
Punjab Alienation of Land Act, object and results of, *Fagan* (55).
Punjab Redemption of Mortgages Act, useful, *Fagan* (55).
Repayment, reasons preventing, *Fagan* (54).
Rural Insolvency measure not advocated, *Fagan* (55).

Agricultural Industries:
in America, policy of Federal Government, *Foley* 58,216-20.
Development of cottage industries with electrical power, under consideration, *Lindsay* 53,996.
in England, development work, *Floud* (3), 52,229-36; *Nash* (605), 57,296-306, 57,329-34.
Fruit and vegetable culture, scope for, in Punjab, and investigation advocated, *Fagan* (59), 52,579-82.
Handwoven silks, scope for, but export through Government Artware Institute desirable, *Lindsay* 53,997, 54,001.
Imitation of cottage industry wares in factories, *Lindsay* 54,002-4.
Industrial concerns, removal to rural areas, little benefit anticipated, *Fagan* (59).
Ireland, position *re*, *Adams* 53,510-1, 53,520-1.
Lac culture and scope for development, *Fagan* (59).
Mango cultivation, investigation advocated, *Fagan* (59).
Need for, and proposals for encouraging, *Fagan* (42), (49), (59), 52,562-70, 52,696-7, 52,734-45.
Pig-keeping, prejudice against, *Fagan* (49).
POULTRY-KEEPING:
in Egypt, *Shearer* 54,167-8.
Prejudice against, *Fagan* (49), (59).
Preparation of agricultural produce for consumption, establishment by Government not advocated, *Fagan* (59).
Requirements, *Fagan* (59).
Rope and basket making, probable prejudice against, *Fagan* (59).

Agricultural Industries—*contd.*

little Scope for, *Keatinge* 56,948-9.
Sericulture, scope for, *Fagan* (59), 52,577.
Social prejudices and restrictions, *Fagan* (49), (59).
Toys, export to England, little scope for, without revision of methods, *Lindsay* 53,998.
Weaving of artistic materials, proposal, *Fagan* (49), (59), 52,574-8.

Agricultural Organisers, England, *Floud* 52,333-5.

Agriculture, Council of, England, *Floud* 52,268-72.

Agriculture, as " transferred " subject:

Advantages of, *Howard* (185), 53,557-61.
Deterioration in wheat owing to lack of central control, *Demetriadi* 54,274-5, 54,349-50.
Question of results, *Fagan* (43-4), 52,584-6.

Agriculture and Fisheries, Ministry of:

Estimates and staff, *Floud* 52,305-12.
Grants for veterinary research, *MacFadyean* (27), 52,404-8.
Organisation, work, etc., *Floud* (1-3), 52,149-2332.
Publicity work, *Floud* (3), 52,192-200, 52,288-90, 52,296-8.
Relations with officers of local authorities, *Floud* 52,185-90.
Staff, recruitment system, *Floud* 52,315-23.
Technical experts, *Floud* 52,277-87, 52,299-300.
Veterinary adviser, *MacFadyean* 52,460-1.

Alienation of Land Act, *see under* **Agricultural Indebtedness.**

ANDERSON, D. A., of Messrs. Caird (Dundee), Ltd., and **ERSKINE SCOTT, G.,** of Messrs. James Scott and Sons, Ltd.; representing the Jute Importers' Association, Dundee: 55,046-55,173.

JUTE:

Bales, mixing of qualities in, 55,046.
Competition of other textiles, position *re*, 55,046, 55,083-86, 55,151-5.
Contract system, 55,122.
Co-operative marketing in India, question of effect, 55,144-50.
Damping of, and consequent deterioration on voyage, 55,046, 55,140-3.
Dundee industry, 55,046, 55,056-64, 55,094-101, 55,110-2, 55,125-7.
Export duty, no difference in quantity as result, 55,088-91.
Government forecasts, inaccuracy of, and injury to trade from, 55,046, 55,046-7, 55,073-6, 55,092-3, 55,102, 55,117-9, 55,128-31, 55,156-63.
Improvement, question of organisation for, 55,077-82, 55,102-9. 55,168-9.
Interests in Great Britain not in direct touch with Agricultural Department in Bengal or jute growers, 55,050-2, 55,069.
Prices, 55,046.
Effect on production, question of, 55,132-4.
Quality:
Deterioration, 55,046, 55,053, 55,124.
Importance of, to Dundee trade, 55,046, 55,065-7, 55,135-8.
Second-hand trade when prices high, 55,086.
Selecting, grading and packing, importance of elimination of irregularities in, 55,046, 55,164-7.
Speculative element in markets, 55,047, 55,073, 55,118-21, 55,130-1.
Substitutes, question of, 55,113-6.
Uses of, 55,046, 55,171-3.

JUTE IMPORTERS' ASSOCIATION, 55,049.

Animal Husbandry.

BULLS:
Castration:
Compulsory, not practical proposition at present, *Gaiger* 58,058-60.
Importance of, *Fagan* (59).
Veterinary assistants could be trained for, by short course, *Gaiger* 58,061-2.
Distribution of approved, properly bred bulls of selected indigenous breeds, importance of, *Fagan* (59).
Cattle breeding, control by Veterinary Department desirable, *Fagan* 52,699-701.
Cattle insurance societies in Denmark, *Faber* 53,058-62.

DAIRY INDUSTRY:
Combination with tillage, proposal, *Fagan* (44), 52,614-7, 52,671-4.
Co-operative creameries, movement in Ireland, *Adams* 53,506-9.
Co-operative societies in Denmark, *Faber* (104, 105, 108), 52,884, 52,897-8, 53,029-47.
Development:
Scope for, in Bombay, but difficulty, *Keatinge* 56,958-64.
Scope for, and proposals, *Fagan* (44), 52,604-5, 52,614-7.
in Kenya, *Ormsby Gore* 55,957.
as Provincial or Central problem, *Chadwick* 55,767.
in Denmark, proceedings for improvement of cattle, *Faber* 53,099-107.
in England, work of Ministry of Agriculture and Fisheries, *Floud* (3), 52,183-6, 52,215, 52,218-23, 52,259, 52,278, 52,324.
Export of cattle, scope for, *Ormsby Gore* 55,975-7.

FODDER:
Crops:
Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
Increased cultivation desirable, and clover the most promising, *Fagan* (60).
Mineral constituents, importance of, and experiments *re*, *Wood* 57,742-56.
Silage, in Egypt, *Shearer* 54,083-6.
Grazing, facilities in forests, *Fagan* (59).

IMPROVEMENT OF BREEDS:
Control by veterinary officers, possible advantage, *MacFadyean* 52,418-20.
Cross-breeding in sheep, experiments in Falkland Islands, *Wood* 57,741.
in Egypt, work *re*, *Shearer* 54,094.
Importance of, *Fagan* (46).
by Selection, scope for, *Shearer* (238).
in Kenya, crossing of country cattle with imported, *Ormsby Gore* 55,891-2, 55,958-9.
Number of cattle greater than normal fodder supply can maintain, *Keatinge* (569).
Pasture, need for real pastures, and question of measures for, *Fagan* (44), 52,618-26.
Religious sentiment, drawback of, *Fagan* (43).

Australia:

Council of Science and Industry, endowment grant, *Butler* 53,354-5.
Evidence *re*, *see* **Julius, G. A.**, (633-653), 57,427-57,579.

Bangalore Institute, reorganisation scheme, *Howard* (186).

BARBER, Dr. C. A., C.I.E., Sc.D., Lecturer and Professor of Agriculture, Cambridge: (751-761), 58,270-58,388.
Services in India, 58,270-1.
CIVIL SERVICE, certain Agricultural training in England, proposal, (760-1), 58,353-9, 58,385-7.

BARBER, Dr. C. A.—*contd.*

COIMBATORE CANE BREEDING STATION:
Mendelian methods, work on, 58,351-6.
Position of, (752).
Programme, proposal, (758-9).
Progress of work, &c., 58,379-82.
Reports, cutting down of, 58,271-2.
Scope of scientific studies at, (759).
Staff required, 58,283.
Stations in the North of India considered desirable, 58,275-83, 58,383-4.
Sub-stations, proposal, (755).
Thick cane work should be separated, and proposal *re*, 58,284-6, 58,369-74.
Work carried out by, and results, (757-60).

CROPS, success of improved varieties, even where no change in cultivation, 58,368.

INDIAN SUGAR COMMITTEE, recommendations of, and opinion *re*, (751), (754), (759-60).

RICE, central research station, not advocated at present, 58,388.

SUGAR INDUSTRY:
Development of, memorandum, (751-57).
Employment of Indian capital and Indian officials, scope for, &c., 58,338-9.
Importance of, 58,330-1.
Imports, 58,337.
Improvements in preparation of raw juice necessary, (755).
Protection:
Justification for, 58,340-1, 58,374-6.
in Other countries, 58,340-1.
Sugar Bureau, work of, and scheme for development, (752), 58,288-303.
White sugar production, India should be self-supporting, 58,337.

SUGARCANE:
Cultivation, improved methods important, but success of improved cane even where no change in method of, 58,363-7
Degeneration and deterioration and causes, 58,345-50.
accurate Descriptions of all canes in India, need for, and proposal, (756-7).
Diseases, 58,349.
Improved varieties:
Propaganda:
Example of success, (753).
Recommendation *re*, (754).
Success of, even where no change in cultivation, 58,360-7.
Improvement, importance of, 58,332.
Indigenous canes, importance of investigation and improvement, (755).
Poona cane, opinion *re*, 58,287.
Propaganda, methods, and example of success, 58,328-9.
Research:
Central Institution with number of sub-stations, scheme for, (753), 58,310-24, 58,377-8.
Scheme, (753, 755-7).
Seedlings:
Java method of short planting for rapid multiplication of seed, difficulties in way of introduction in India, 58,325-6.
One-bud system of planting, no advantage, 58,327.
Species of canes and origins, 58,342-7.
Tropical canes, acclimatisation, study of problem advocated, (756).

Barley, export:

Formerly, and possibilities of development, *Demetriadi* 54,344, 54,436-7; *Taylor* 54,438.
Position, *Robson* 55,457-63, 55,468-70, 55,573-7.
Statistics of, in 1913, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, *Robson* 55,452-6, 55,464-7.

Beans:

Burma, market for, *Swan* 55,040.
Prussic acid question, *Lindsay* 53,822; *Swan* 55,039-43.

Berseem, prospects in India, *Shearer* 54,201-4.

BIFFEN, Sir Rowland, Kt., M.A., F.R.S., Professor of Agricultural Botany, Cambridge University: (702-4), 57,757-57,832.

CAMBRIDGE UNIVERSITY:
Indian students, previous education, etc., 57,762-72.
Plant Breeding Institute, functions, work carried out, etc., (702-4), 57,757-829.

PLANT BREEDING, organisation, opinion *re*, 57,760-1, 57,788-9.

RESEARCH:
Organisation, by crops, proposal, 57,830-2.
Relationship with teaching, opinion *re*, 57,786-7.

SEED DISTRIBUTION:
from Cambridge, system, 57,798-805, 57,815-23.
Seed Act would be necessary if distribution by private enterprise, 57,826.

British Empire Producers' Organisation, India not represented on, but representation desirable, *Lindsay* 53,991-3.

British Guiana, emigraton to, proposal, *Keatinge* 57,006-7, 57,010-17, 57,048.

British Sulphate of Ammonia Federation, Limited.

Evidence on behalf of, *see* Speyer, F.C.O. (471-488), 56,320-56,473.
Organisation, *Speyer* (480), (480-1).

Bulls, *see under* **Animal Husbandry.**

BUTLER, Dr. E. J., C.I.E., D.Sc., M.B., F.R.S., Imperial Bureau of Mycology, Kew: (146-150), 53,314-53,490.
Previous service, 5315-7.

AUSTRALIA, Council of Science and Industry, endowment grant, 53,354-5.

BOARD OF AGRICULTURE, value of meetings, 53,352, 53,395.

CALCUTTA UNIVERSITY, post-graduate teaching, opinion *re*, 53,346-9.

CROPS:
Improvement, importance of, (149).
Protection:
from External infection, measures considered on right lines, efficacy dependent on carrying out of, (147).
from Internal infection, extension desirable as occasion requires, (147).
Tobacco, research needed, 53,336.

IMPERIAL BUREAU OF MYCOLOGY:
as Central clearing house of information, 53,406-9.
Contact with Colonies, 53,407-9.
Finance of, 53,327, 53,357, 53,381-2.
Functions, 53,406.
Managing Committee, 53,323-6, 53,383.

BUTLER, Dr. E. J.—*contd.*

PUSA RESEARCH INSTITUTE:
Cattle breeding work, doubt as to suitability, 53,350, 53,448-51, 53,476-7.
as isolated Central institute for fundamental research, proposal, 53,359-64, 53,384-9, 53,396-7.
Continuance of, but not as Government institution, scheme and proposed constitution of Board of Management, (147), 53,322-3, 53,328-38, 53,342-3, 53,367-71, 53,394, 53,435-40, 53,453-5.
as Constituent College of University not desirable, but arrangement for students to get degrees by presentation of theses would be approved, 53,376, 53,398-405.
Council, opinion *re* efficiency of, 53,375.
Director:
Administrative work, proposals for relief from, 53,456-61.
Communications with Agricultural Adviser, work *re*, and proposed change, 53,458-67.
Whole-time, proposal for, 53,336, 53,360-1.
Division of functions between Provincial Institutes and, proposal, 53,350-2, 53,472-3.
Financing, proposal, 53,353-4, 53,468-71.
Higher research staff, English officers necessary for considerable period, and question of possibility of obtaining, (147), 53,414-29.
Meetings and conferences at, should be encouraged, 53,362.
Original scheme, (147-8).
Output and quality of research, believed to have declined and possible reasons, (146), 53,318-21, 53,444-5.
Position of, (146-7).
Position of, in Agricultural Department, (147-150).
Post-graduate training:
Indian students, training and qualifications on coming for training, 53,343-9, 53,430-4, 53,441-2.
Results and recommendation *re*, (150), 53,365-6, 53,398-405.
Site, handicap of, and Jubbulpore would be better, (147), 53,478-90.
Staff, reductions, (146), 53,445, 53,469-71.
Work, attempt to cover too wide a field, 53,446-51.

RESEARCH:
Central Clearing house of information on lines of Imperial Bureau of Mycology, question of, 53,409-13.
Colonial chain of research stations, scheme.
Administration, 53,323, 53,328.
Indian co-operation, proposal, 53,328-30.
Colonial Office Advisory Council system, question of application to India, 53,372-4.
Co-ordinating agency not advocated, voluntary contact preferable, 53,342, 53,390-4.
Council, possibility of, and functions, 53,339-41, 53,395.
Mycology, present staff inadequate and extent of increase desirable, 53,377-9.
National Research Council, America, functions, 53,340-1.
Overlapping, not a drawback, 53,397.
Requirements, (149).
Workers, rural upbringing desirable, 53,430-4, 53,443.

BUXTON, Professor J. O. S., M.A., F.R.C.V.S., Cambridge University, (710), 57,833-57,908.

CAMBRIDGE, INSTITUTE OF ANIMAL PATHOLOGY, 57,888-92, 57,898-902.

RESEARCH:
Relations with teaching, opinion *re*, 57,860-1.
Workers, recruitment proposal, 57,903-8, 58,047-51.

BUXTON, Professor J. O. S.—*contd.*

VETERINARY:
Civil Veterinary Department, should be independent, (710), 57,835.
Contagious Diseases:
Control in America, 57,838-41, 57,867-70, 57,880-1.
Legislation advocated, (710), 57,836-41, 57,877.
Preventive inoculation, simultaneous method, value compared with serum-alone method, 57,843-9, 57,871-5.
Research:
Central and subsidiary stations advocated, 57,859, 57,864-6, 57,884-7.
further Facilities advocated, (710), 57,859.
Rinderpest, research *re*, proposal, 57,876.
Serum:
Distribution system in England, 57,893-7.
Storage at number of centres, adequate facilities advocated, (710), 57, 842, 57,878-9.
Superior Veterinary officer with Government of India, appointment advocated and proposed functions, (710), 57,862-3.

Cambridge University:
See also **Wood, Professor T. B.**, and **Engledow, F. L., M.A.**, (676-683), 57,602-57,756.
Cross-breeding in sheep, experiments, *Wood* 57,741.
Indian students, previous training, etc., *Biffen* 57,762-72.
Institute of Animal Pathology, *Buxton*, 57,888-92, 57,898-902.
Plant Breeding Institute, functions, work carried out, etc., *Biffen* (702-4), 57,757-829.

Canada:
Agricultural education, *Wilson* 56,617-8.
Agricultural legislation, administration and research in, *Wilson* (529-33), 56,573-671.
Contagious diseases, control, *Wilson* (529), 56,619-22.
Co-operative movement, *Wilson* 56,603-8.
Experimental farm system, *Wilson* 56,623-35.
Research organisation, *Wilson* (529-32), 56,573-93, 56,659-61.
Seed distribution to school boys and girls, *Wilson* 56,655-8.
Tobacco cultivation and market, *Wilson* 56,662-8.
Wheat, pool system, *Wilson* (533-5), 56,601-2, 56,607-16, 56,636-54.

Canals, *see under* **Irrigation.**

Capital, factors deterring men of enterprise and capital from taking up agriculture, *Keatinge* (569).

CARMICHAEL, L. T., and **McLEOD, Major Norman,** Indian Tea Association (London): (388-391), 55,580-55,738.

INDIAN TEA ASSOCIATION (LONDON):
Composition, functions, etc., 55,590-5.
Jorhat laboratory, recruitment of experts, method, 55,640-2.
TEA:
Capital, Indian, 55,611-5.
Committee, Cess:
Constitution, 55,700, 55,714-6.
Operations in U.S.A. and France, (388-91), 55,586-9, 55,698-9.
Money devoted to propaganda work, 55,701, 55,712-3.
Price not affected by, 55,709.
Revenue from, 55,710-1.
Ceylon Association, 55,657-9.
Coffee competition, question of, 55,687-9.
Comparison with Ceylon tea as regards quality and price, 55,667-70.
Competition of other countries, 55,645-6, 55,663-6, 55,681-6, 55,706-8, 55,722-3, 55,726-31.

CARMICHAEL, L. T., and McLEOD, Major Norman—*contd.*

TEA—*contd.*

Estates:

of Co-operative Wholesale Society, 55,733-4.

Labour, position *re*, and removal of restrictions on recruitment desired, 55,599-610, 55,616-31, 55,651, 55,671-6, 55,702-5, 55,719-21.

Welfare and education work, 55,717-8.

Export:

Increase in fifty years, and future prospects, 55,635-9.

Mark of origin on packets of tea, proposal, 55,596-8.

Position in different markets, 55,645-9, 55,651, 55,663-6, 55,690-7, 55,735-8.

Position as regards world trade, 55,583.

Statistics, (389-391), 55,660-2.

Fertilisers, means of obtaining, 55,643-4.

One organisation for the British Empire, desired, 55,724-5.

Organisation of trade, 55,585.

Quality, policy of Indian Tea Association, 55,677-80, 55,682-3.

Southern India industry, relations with Indian Tea Association and question of combined Association, 55,652-6.

Castorseed, *see under* **Oilseeds.**

Cattle Breeding, *see under* **Animal Husbandry.**

CHADWICK, Sir David, C.S.I., C.I.E., Secretary, Imperial Economic Committee: (401-405), 55,739-55,873.

BOARD OF AGRICULTURE, value of meetings formerly, 55,869-70.

DAIRYING, as provincial or central problem, 55,767.

EMPIRE MARKETING BOARD, grants, system, 55,765.

IMPERIAL ECONOMIC COMMITTEE, constitution, functions and method of working, 55,741-3.

IRON AND STEEL INDUSTRY, protection, 55,834, 55,840.

MANUFACTURING INDUSTRIES, Indian students in England, work dealt with by High Commissioner's Office, 55,810-1, 55,813.

MARKETING:

Admixture of dirt, 55,758.

EXPORT:

Better cleaning, grading and packing, importance of, 55,758-9.

Reputation of Indian produce on European market and suggestions for improvement, (403), 55,757.

Standards, question of, (403), 55,760.

Improvement of conditions, should be recognised as important function of Agricultural Department, (402), 55,778-82, 55,793-801.

Preparation of produce for, improvement, importance of, and duty should be recognised as important function of Agricultural Department, (402), 55,778-82, 55,816-21.

PUSA RESEARCH INSTITUTE, conferences, proposal, (405).

RESEARCH:

Conferences with experts from outside India, suggestion, (405), 55,761-3.

Co-ordination, importance of, and scheme, (404-5), 55,740, 55,771-7, 55,846, 55,854-5, 55,863-4.

Distribution between provincial and central authorities, 55,765-70.

Financing of:

Allotment of fixed sum annually or establishment of fund, proposal, (405).

Central fund, scheme, (404-5), 55,764-70, 55,858-62.

by Export cesses, approved for particular trades but not for agricultural produce generally, 55,865-7.

CHADWICK, Sir David—*contd.*

RESEARCH—*contd.*
Publications, interchange between provinces and with other countries, 55,847-56.

SUGAR INDUSTRY:
Import of sugar, question of effect, 55,843.
specific Import duty, benefit to industry, 55,840-1, 55,845.
Protective duty, no application made for, 55,836-7, 55,840-1.

TEA INDUSTRY, restrictions on recruitment of labour, 55,835, 55,840, 55,842.

TRADE OF INDIA:
Domestic, importance of, (402), 55,787, 55,802-9, 55,814-21.
Export, falling off in, would have bad effect on producers, 55,871-3.
Foreign:
Future prospects, (401), 55,754.
Statistics, and comparison with Crown Colonies and Mandated Territories, (401), 55,755-6, 55,783-6, 55,857.
Import:
Development, 55,790.
Treasure, 55,790-2.

TRADE COMMISSIONERS:
in America, not proposed, 55,747, 55,749.
in East Africa, at one time, but no scope for, permanently, 55,868.
in Germany, proposal, (404), 55,747.
in London:
Advisory body, not necessary, 55,744-6.
Functions, 55,750, 55,810-1.
Office:
Accommodation in India House proposed, (403-4), 55,751-3.
Removal to Grosvenor Gardens, work handicapped by, (403).
Relations with High Commissioner, (403-4), 55,752-3.
Staff, proposed increase, (403-4), 55,748.
Value of, to large firms, 55,746, 55,812.
in Other countries:
Advocated in future, after training in London, (404), 55,747-8.
Deputations or visits from the trade preferable as regards certain countries, 55,868.
in Southern France and Northern Italy, proposal, (404), 55,747.

VILLAGE INDUSTRIES, position of, and question of action re, 55,822-32.

China:
British Sulphate of Ammonia Federation work in, *Speyer* 56,369-75.
Night soil, use of, and effect of use of sulphate of ammonia, *Speyer* 56,398-9.

Coffee, *see under* **Crops.**

Coimbatore Cane Breeding Station, *see under* **Sugarcane.**

Colonies, agricultural exports, statistics, *Ormsby Gore* (435-6).

Co-operation:
in America, *Foley* 58,087-9, 58,121-4, (814).
Beneficial results, *Fagan* (61).
Breeding societies in Denmark, *Faber* (105), 52,888, 52,901-3.
in Canada, *Wilson* 56,603-6.
Consolidation of holdings by, *see under* **Holdings.**
CREDIT SOCIETIES:
in Denmark, *Faber* (104), 52,889-90, 52,900, 52,967-8.
Rates of interest charged, *Speyer* (482).
Requirements for success, *Fagan* (61-2).

Co-operation—*contd.*
in Denmark, *Faber* (104-6), 52,881-903, 52,967-70, 52,997-3008, 53,029-47, 53,058-62, 53,070-3, 53,104-7, 53,111, 53,126-9.
Encouragement of, in all branches needed, *Fagan* (42), (48), (49), (61), 52,571-3.
in England, Ireland and Scotland, *Nash* (605).
Exporting societies in Denmark, *Faber* (105, 107-8), 52,909-16.
Fertilisers, sale through, *Speyer* 56,387-9.
Government relations with, recommendation, *Fagan* (61).
Implements, obstacles in way of distribution through, *Goodwyn* 56,287-8.
Ireland, movement in, *Adams* 53,503-9.
Joint improvement schemes, opinion *re* legislation on minority, *Fagan* (62).
Milk recording societies in Denmark, *Faber* (105), 52,888, 53,104-7.
Non-credit societies in the Punjab, *Fagan* (62), 52,679-80.
Production societies in Denmark, *Faber* (104-5, 108), 52,888, 53,001-4.
Purchase societies, *Faber* (105, 106), 52,888, 53,005-8.

SALE SOCIETIES:
in Canada, *Wilson* 56,605-6.
in Denmark, *Faber* (104, 105, 106, 108), 52,888, 52,891-2.

Copra:
Export trade, question of prospects, *Knight* 56,100-4.
Import duty on copra from Ceylon, and effect on export of copra from Malabar, *Steiner* 54,536-41, 54,594-5.
Imports by Messrs. Jurgens, *Knight* 56,086-9.

MALABAR:
Exports from, small, *Knight* 56,100.
Quality, and use of, *Knight* 56,089-91.
Quality, but little received in England, *Frost* (295).

Cotton:
American competition, *Pfister* 54,319.
Area under, in India, 1903-4, 1913-14, 1923-24 (805).
Burma, increased production desired, *Swan* 54,916.
Colonial exports, *Ormsby-Gore* (435).
from Colonies, *Littlewood* 55,336-40.
Complaints by merchants in England, nature of, &c., *Lindsay* 53,810, 53,825.
Cultivation, machine heavier and more powerful than standard tractor needed, *Rowland* (451).

DAMPING:
Difficulty caused by, in England, *Littlewood* 55,302, 55,303.
Judicious damping as carried out by natives formerly, beneficial, *Pfister* 54,333.
Prevention, difficulty, *Pfister* 54,334, 54,336; *Demetriadi* 54,336, 54,337-8.
Prevention of undue and excess damping, possible means of, *Demetriadi* 54,332, 54,445; *Pfister* 54,448-53.
possible Reconsideration of position by Messrs. Ralli Bros. owing to effect of, on trade, *Demetriadi* 54,332.
Use of hose on cotton, and bad effects, *Pfister* 54,333, 54,335.

EXPORT:
Advertising of Indian cotton, might be increased if quality improved, *Littlewood* 55,392-3.
Bales:
400 lb. bale should be maximum, *Littlewood* (365), 55,302.
Density of Indian bales compared with American, *Littlewood* (365), 55,302, 55,330-5.
Complaints, clearing house for, in England, proposal, *Littlewood* (365), 55,307-9, 55,380-1, 55,388-9.

Cotton—*contd.*

EXPORT—*contd.*
Grading on lines of American universal standards, proposal, *Littlewood* (365), 55,225-9, 55,341-7.
Improved varieties:
Demand for, *Grantham* 57,074.
Desirability of being able to distinguish, on the market, *Littlewood* 55,296-8, 55,317, 55,324.
special Mark or designation for, impracticable and undesirable, *Grantham* 57,073-4.
Marketing of bales with name of ginnery, desirability of extension of system, *Littlewood* (365), 55,310-12.
Mixing of cotton by merchants, to secure particular types for, *Grantham* (584-5), 57,118-22, 57,132-37.
Price, narrowness of margin between Middling American and F.G.F. Tinnevelly, and effect, *Littlewood* 55,299-300.
Quantity of Indian cotton used in Lancashire, *Littlewood* 55,362.
Standard, deferred delivery contract, need for, and proposal, *Littlewood* (365), 55,304-6, 55,325-9, 55,341-7, 55,384-5.
Style of cotton required by English spinners, *Littlewood* (364).

GINNING:
need for Increased care and saw gins advocated, *Littlewood*, (364), 55,354-61, 55,382-3, 55,395-400.
Mixing of cotton in, and question of remedy, *Grantham* (584), 57,104-17.
Saw, disadvantages of, *Grantham* 57,100-3.
Gins and presses, licensing of, in Rajpipla, and good results of, *Grantham* 57,107-11.
Improvement in condition anticipated, *Lindsay* (213).
Improvement by hybridisation, scope for, *Howard* 53,681.
Long staple, question of demand, *Grantham* 57,150-4.
Longer and medium staples, encouragement advocated, *Grantham* 57,093.
Manuring and soil problems in connection with, *Howard* 53,691-6.

MARKETING:
in Egypt, *Shearer* 54,103-6, 54,108-9.
Hedge contracts, effect on, and proposals *re*, *Grantham* (585-6), (589-92), 57,070-2.
Information as to market conditions, *Grantham* (585-6).
Open markets with representation of growers on managing committees, desirable, and question of possibility, *Grantham* (583), 57,075-6.
Passing on of price fluctuations in Bombay to up country markets, extent of, *Grantham* 57,068.
Premium for quality not always received by cultivators, but importance of, *Grantham* 57,065-7.
Prospects, *Grantham* (583).
Mixing of, and measures taken to prevent, *Lindsay* 54,786.
Picking, leaves in, and need for improvement, *Grantham* (584), 58,094-8.

PUNJAB AMERICAN:
Deterioration, *Littlewood* 55,318-9; *Grantham* 57,141-8.
Question of profit from growing long *versus* short staple cotton, *Pfister* 54,317-9.
Purity, importance of, *Fagan* (51).

SEED:
Crushing of, trouble caused by; *Littlewood* (364).
Deterioration of, *Littlewood* (364), 55,318-9, 55,348-53.
Mixing of, *Littlewood* (364).
Short staple, question of extent of demand for, and prospects in future, *Grantham* (582), 57,084-92, 57,138-40.

Cotton—*contd.*
Short staple or long staple, factors governing growing of, *Grantham* 57,068-9.
Spinning tests by Oldham Master Cotton Spinners' Association, *Littlewood* (365), 55,301, 53,313-6, 55,363-75.
Staple, mixing of, and importance of keeping separate, *Littlewood* (364), 55,320.
Statistics, crop statistics and forecasts, inaccuracy of, and proposal for improvement, *Grantham* (586), 57,123-8.
Sulphate of ammonia, probable large consumption and supply of mixed manures proposed, *Speyer* 56,448-9.

Cotton cake, question of future demand for, in England, Frost 54,724.

Cottonseed, *see under* **Oilseeds.**

Credit, *see under* **Agricultural Indebtedness** *and* **Finance.**

Crops:
Areas under various crops, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
Barley, *see that title.*
Beans, *see that title.*
Berseem, *see that title.*
Change from subsistence farming to commercial, need for, *Fagan* (42), 52,521, 52,654-9, 52,695.
COFFEE:
Exports, statistics and proposed cess, *Lindsay* (806-7).
Research, financing of, *Lindsay* (212).
Cotton, *see that title.*
Damage by wild pigs, and proposals for destruction, *Keatinge* (570).
Groundnuts, *see that title.*
IMPROVED VARIETIES:
Effect on fertility of the soil, question of, *Howard* (176), 53,691-5.
Success of, even where no change in cultivation, *Barber* 58,368.
IMPROVEMENT:
Dependent on enhanced value to grower, *Demetriadi* 54,317; *Pfister* 54,317.
Importance of, *Butler* (149).
Scope for, and experience in Egypt and America, *Shearer* (238).
Selection, scope for, *Engledow* 57,681-2.
Work should be branch of research, and should not be limited to one crop, *Howard* 53,642-4.
Indigo, research, proposal *re* financing, *Lindsay* (212), (806-7).
Oilseeds, *see that title.*
PESTS AND DISEASES:
Effect of calcium cyanamide, *Greening* (748).
Problems of, and need for organised research, *Howard* (180-2).
Water hyacinth, proposed research *re*, with grant from Empire Marketing Board, *Lindsay* 53,829-36.
PLANT BREEDING:
Organisation, opinions *re*, *Biffen* 57,760-1, 57,788-9.
proposed Organisation and danger of specialisation, *Engledow* 57,640, 57,676-82, 57,713-7.
Work at Cambridge, *Biffen* (702-4), 57,757-829.
PROTECTION:
in Egypt, *Shearer* (238), 54,250-2.
from External infection, measures considered on right lines, efficacy dependent on carrying out of, *Butler* (147).
from Internal infection, extension desirable as occasion requires, *Butler* (147).

Crops—*contd.*

SEEDS, DISTRIBUTION:
from Cambridge, system, *Biffen* 57,798-805, 57,815-23.
Seed Act would be necessary if distribution by private enterprise, *Biffen* 57,826.
Sugar, *see that title.*
Tea, *see that title.*
Tobacco, *see that title.*
Wheat, *see that title.*

Cultivation:

Banjar lands, question of, *Fagan* 52,587-92.
Deeper and more thorough cultivation, advantages of, and improvement of soil by, *Pelly* (624-5).

DRY FARMING:
in the Deccan, position *re*, *Keatinge* 56,929-36, 56,999-7001.
Intensive farming, success would depend on soil, *Keatinge* 56,998.
Egypt, farming under dry conditions, *Shearer* 54,042-5, 54,169-71.
Heavy power tillage, unsuitability of, for small holdings, *Rowland* 56,172; *Goodwyn* 56,172-4.
Indigenous systems, success of, *Howard* (174-5).
by Large landowners, in Egypt, *Shearer* 54,121-5.
Pulverisation, advantages of, and advantages of Fowler's cable tackle for, *Pelly* (625).
Tillage, cultivators should be educated to replace ox cultivation by mechanical cultivation with suitable machinery, *Pelly* (626).

Dairy Industry, *see under* **Animal Husbandry.**

DEMETRIADI, Sir Stephen, K.B.E., representing Messrs. Ralli Brothers and the London Chamber of Commerce: 54,271-447.

AGRICULTURE, as a "transferred" subject, deterioration in wheat owing to lack of central control, 54,274-5, 54,349-50.

BARLEY, export formerly and possibilities of development, 54,344, 54,436-7.

COTTON:
Damping:
Prevention of excess damping, difficulty and possible means of, 54,332, 54,336-8, 54,443-7.
possible Reconsideration of position by Messrs. Ralli Bros. owing to effect of, on trade, 54,332.

CROPS, improvement, dependent on enhanced value to growers, 54,317.

EXPORT TRADE, rupee at 1s. 4d. would have assisted, 54,339.

GRAM, export, increased supply desirable, 54,344.

OILSEEDS, export of oil and retention of cake in India, exporters would not help to stimulate, 54,398.

RESEARCH, desirability of central control and deterioration in wheat since agriculture a transferred subject, 54,274-5, 54,316, 54,349-50.

SEA FREIGHTS, deferred rebate system, and drawbacks of, 54,324-30.

STATISTICS, crop forecasts, period at which required by exporters, 54,372-6.

TRADE COMMISSIONER IN LONDON:
Advisory Committee, not advocated, 54,323.
Office in the City, desirability of, 54,321-2.
Valuable work done by, 54,321.

WEIGHTS AND MEASURES, uniformity question, 54,363-6.

DEMETRIADI, Sir Stephen—*contd.*
WHEAT:
Advantage of, for mixing purposes, 54,295-7.
Export:
Bulk storage and handling:
Attitude of Messrs. Ralli Bros., 54,313-4.
no Difficulty anticipated as regards construction of steamers, 54,312.
Cess on, probable disastrous effect, 54,385.
Creation of new markets for, and competition with wheat from other countries, question of, 54,301-5.
Decrease, 54,392-6.
Demand for, affected by uncertainty as to supply, 54,293-4.
492 lbs. basis formerly, but change effected to 480 lbs., 54,301-4.
Increase in quantity and free export of more importance than improvement in quality, 54,272, 54,298.
Increased supply anticipated as result of Sukkur Barrage scheme, 54,345, 54,348.
Quality:
Deterioration of, from some districts, and causes, 54,272-7, 54,349-54, 54,380-4, 54,424-5.
would Improve if larger crops produced, 54,272, 54,294-5.
Sale on "pure" wheat basis, 54,407-9, 54,460-1, 54,467-8.
Elevators, no advantage seen, 54,471-2.
Increased production, importance of, 54,272, 54,294.
Karachi, attempt to improve quality but non-success owing to millers being unable to pay premium, 54,288, 54,291, 54,428-32, 54,439.
Yield per acre, and need for increase, 54,294.

Demonstration and Propaganda:
on CULTIVATOR'S LAND:
Approved, *Fagan* (52).
Payments to cultivators in event of loss, in Egypt, *Shearer* (237), 54,046-9.
Demonstration farms:
in America, *Foley* 58,183-5.
in Egypt, *Shearer* (237), 54,046-53.
Experimental farms, visits of parties of cultivators to, useful, *Fagan* (52).
Importance of, *Lindsay* (209), (211).
Improvement of practice of cultivators, measures for, *Fagan* (52)
Vernacular leaflets, proposed use of, *Macphail* 57,601.

Denmark, evidence *re*, see **FABER, H.** (104-108), 52,879-53,166.

Development Commission, England:
Advantage of system, *Nash* 57,244-6.
Advisory Committees, *Nash* (602), 57,168-70.
Advisory service in connection with colleges, research institutions and farmers, *Nash* (603), 57,215-7.
Afforestation work, *Nash* 57,326.
Analogies to, *Nash* 57,187.
Approval of principle of, *Elliot* 53,258-60; *Russell* 58,447-8.
Commissioners, number, meetings, position, etc., *Nash* 57,181-6, 57,206-9.
Establishment of, and reasons for setting up of, *Nash* (600), 57,188, 57,191, 57,254-8.
Financial arrangements and position, *Nash* 57,193-202, 57,234-6.
Functions of, and work, *Orr* 53,198, 53,208, 53,210-2, 53,218-22, 53,229-32; *Nash* (600), (601-2), (603), (604-6), 57,188-92, 57,198, 57,243, 57,321-5.

Development Commission, England:

GRANTS:
in aid of Agricultural co-operation, *Nash* (605).
Particulars *re*, *Nash* (604).
£ for £ system, advantage of, *Nash* 57,171.
System, *Nash* (600-3), 57,171-2, 57,175-80, 57,226-42.
Land acquisition powers, *Nash* (605).
Method of working, *Nash* (602), 57,166, 57,176-80, 57,218-25.
Public attitude to work of, *Nash* 57,161-5.
Relations with bodies like Carnegie Trustees and Rockefeller Foundation, *Nash* (606), 57,172, 57,203-5.
Relations with Departments of Agriculture in Great Britain, *Floud* 52,256-7.
Relations to Ministry of Agriculture and Fisheries, and agricultural education, *Floud* 52,174-82, 52,210-7.
Relations with Road Board, *Nash* (605-6).
Rural industries work *Nash* (604), 57,296-300, 57,329-34.
Representation on, and distribution of work between Commissioners, *Nash* 57,182-4.
Success of system, *Floud* 52,179-82.
System and possible improvements, *Hall* 52,793-802, 52,813, 52,820-1.

Director-General of Commercial Intelligence and Statistics, functions, *Lindsay* 53,780-2.

Edinburgh University:

Degree courses, *Shearer* 54,188-93.
Graduates from, as Deputy Directors for Indian Agricultural Service, suitability of, and question of subsequent training in India, *Shearer* 54,625, 54,269-70.
Indian students, opinion *re* previous training, *Shearer* 54,145-52.
Recruitment from, for service in India, not considered possibility unless permanency guaranteed, *Shearer* 54,194-6.

Education:

ADULT:
in Denmark, *Faber* 53,087-9.
Folk schools, in Denmark, system, *Faber* (106-107), 52,908, 53,020-2, 53,070-3, 53,086, 53,090-8.
spread of Juvenile literacy of first importance, *Fagan* 52,686.

AGRICULTURAL:
Adult, best means of, *Fagan* (52), 52,687-8.
in African Colonies, *Ormsby Gore* 55,995-6.
in America, *Shearer* (233), 54,136-8; *Foley* 58,099-101, 58,166, (814).
in Canada, *Wilson* 56,617-8.
Colleges:
Course, requirements, *Shearer* (233-4).
Scope should be extended, *Rowland* (451).
Staff, improvement desirable and proposals for, *Shearer* (235-6)
Students, source of, *Shearer* (235).
in Denmark, *Faber* 53,074-85, 53,095-7, 53,146.
in Egypt, *Shearer* (236), 54,139-44, 54,228-31, 54,255-9.
in England, *Floud* (2), 52,164-73, 52,189, 52,210-6, 52,240-1; *Shearer* (233); *Nash* (603).
Cambridge University, *see that title.*
General considerations, *Shearer* (232-6).
Incentives to study, *Fagan* (52).
Institutions, increase needed, *Rowland* (451); *Goodwyn* 56,205.
Loni School, *Keatinge* 57,056.
Madras College, affiliation to university, *Macphail* 57,581.
in Middle schools, proposal, *Fagan* (52), (62).

Education—*contd.*

AGRICULTURE—*contd.*
in Middle vernacular schools, Punjab, *Fagan* 52,641-6.
Policy advocated, *Wood*, *Engledow* (678).
in Primary schools, proposal, *Fagan* (52), (62).
Requirements and proposals, *Fagan* (42), (47), (52), 52,676-8, 52,708-10.
Teachers should be drawn from agricultural classes if qualified men available, *Fagan* (52).
Training Colleges in Australia, *Julius* 57,508-13.
Two years' leaving certificate course, proposal, *Fagan* (47), 52,676.
University courses, danger in connection with, *Macphail* 57,584.
in Agricultural economics, position in Great Britain and Ireland, and importance of, *Adams* 53,533-43.
Calcutta University, Post-graduate teaching, opinion *re*, *Butler* 53,346-9
Canada, administration, *Wilson* (526).
Importance of, compared with communications in the Punjab, *Fagan* 52,684-5, 52,711-3
Nature study, value of, *Fagan* (52); *Shearer* (234).

PRIMARY:
Compulsory:
Attitude of cultivators, *Fagan* (63).
Necessary for universal literacy, but obstacles in way of, and question of overcoming, *Fagan* (62), 52,547-56, 52,593-603.
in Denmark, *Faber* 53,140-53, (808-13).
Development, importance of, *Macphail* 57,601.
Increasing of proportion of boys passing through fourth class, question of possible means, *Fagan* 52,557-61.
Small proportion of boys passing through fourth class, reason, *Fagan* (63).
Rural, requirements, *Fagan* (62), (62-3).
School farms, value of, *Fagan* (52).
School plots, value of, *Fagan* (52).
Sons of cultivators drawn away from interest in the land, *Fagan* (63), 52,540-1.

UNIVERSITIES:
Biological teaching, *Macphail* 57,594-7.
Closer connection with agriculture and research, question of, *Macphail* 57,584-601.
Pure science teaching, opinions *re*, *Shearer* 54,148-52.
Scientific teaching, directions in which improvement desirable, *Russell* 58,427.

Egypt:

Agricultural conditions, and comparison with India, *Shearer* (236), 54,031-45, 54,126-7, 54,156-63, 54,169-75, 54,200-1, 54,232-6.
Agricultural credit conditions in, *Shearer* 54,009-30, 54,108-9, 54,176-80.
Agricultural Department, organisation and link with cultivators, *Shearer* 54,205-9, 54,245-9.
Animal husbandry, *Shearer* (238), 54,081-94.
Agricultural education, *Shearer* (236), 54,139-44, 54,228-31, 54,255-9.
Co-operative movement, no development, *Shearer* 54,107.
Crop quarantine organisation, *Shearer* (238), 54,250-2.
Crops, improvement of, measures, *Shearer* (238).
Demonstration and propaganda, *Shearer* (237), 54,046-53.
Exports, *Shearer* 54,158-63.

FERTILISERS, artificial:
Sale system, *Speyer* (483), (486), (487-8), 56,403-6, 56,425-7.
Use of, *Shearer* (237).
Fruit trees, *Shearer* 54,238.
Higher education in, *Shearer* 54,222-4.
Holdings, fragmentation problem, *Shearer* 54,111-20.
Implements and machinery, *Shearer* (238); *Goodwyn* 56,269-81.

Egypt—*contd.*
Irrigation in, *Shearer* (238), 54,054-67, 54,094, 54,164-6, 54,264.
Khedivial Agricultural Society, *Shearer* 54,208-9, 54,239-44.
Large landowners, farming by, *Shearer* 54,121-5.
Law of succession in, *Shearer* 54,110-1, 54,153-5.
Marketing, system of, *Shearer* 54,096-109.
Moneylenders, *Shearer* 54,010-2, 54,025-7.
Poultry keeping, *Shearer* 54,167-8.
Reclamation work, *Pelly* 57,383-6.
Research in, *Shearer* (237), 54,237, 54,261.
Effect of Egyptianisation of service on, *Shearer* 54,218-27.
Soil:
Alkali, reclamation, *Shearer* (237), 54,054.
Deterioration from lack of drainage, *Shearer* (237), 54,263.
State Domains Administration, *Shearer* 54,261.
Veterinary, *Shearer* (238), 54,068-80, 54,214-7, 54,253-4.
Welfare of rural population, *Shearer* 54,128-33.

ELLIOT, Major Walter, M.P., M.C., D.Sc., Under-Secretary of State for Scotland: (136-137), 53,247-53,313.
Empire Marketing Board:
proposed Chain of research stations, (137), 53,285-9.
Indian co-operation, question of, (137), 53,268, 53,313.
Constitution and functions, &c., (136), 53,269-81, 53,302-7.
Financing of schemes in United Kingdom, 53,255.
Grants:
India eligible for, but no submissions made for, and procedure for obtaining, (136-7), 53,249-50, 53,295-300.
System, 53,250-3, 53,307-12.
Relations with Committee of Civil Research, 53,254.
Relations with Development Commission, 53,256-7, 53,301.
Representation of India on, 53,248, 53,273-4.
Research policy of, (136-7).
Imperial Economic Committee, 53,281-4.
Research:
Colonial services, Corps basis with free interchange, scheme, and question of relationship of Dominions to, (137), 53,289-94, 53,262-67.
Development Commission, approval of principle of, 53,258-60.

Emigration, to South America, &c., suggestion, *Keating* 56,946-7, 57,002-17, 57,048.

Empire Marketing Board:
Advertising of Indian products not considered necessary, *Steiner* 54,636-40.
Assistance of Imperial Institute, *Furse* 56,480.
Connection of Rowett Institute with, *Orr* 53,214-5.
Constitution and functions, &c., *Elliot* (136), 53,269-81, 53,302-7.
Financing of schemes in United Kingdom, *Elliot* 53,255.
Functions, *Lindsay* 53,906.
Grants:
India eligible for, but no submissions made for, and procedure for obtaining, *Elliot* (136-7), 53,249-50, 53,295-300.
Institutions, &c., in India, position re, *Lindsay* 53,828-39, 53,877-8.
System, *Elliot* 53,250-3, 53,307-12; *Chadwick* 55,765.
Link between Imperial Institute and, and avoidance of overlapping, *Furse* 56,489.
Questionnaire on irrigation, *Lindsay* 53,876.
Relations with Committee of Civil Research, *Elliot* 53,254.
Relations with Development Commission, *Elliot* 53,256-7, 53,301.

Empire Marketing Board—*contd.*
Representation of India on, *Elliot* 53,248, 53,273-4.
Research policy of, *Elliot* (136-7).
Results of advertising work of, and possibility of India sharing in benefit, *Ormsby Gore* 56,003-6.

Engineering Institution, *Ward, Gebbie* 56,851-6.

ENGLEDOW, F. L., M.A., *see* **WOOD, Professor T. B., M.A.**, and **ENGLEDOW, F. L.**, (676-683), 57,602-57,756.

ERSKINE SCOTT, G., of Messrs. James Scott and Sons, Ltd., *see* **ANDERSON, D. A.**, and **ERSKINE, SCOTT, G.**: 55,046-55,173.

Export Trade, *see under* **Trade**:

FABER, H., Agricultural Commissioner to the Danish Government: (104-108), 52,879-53,166, (808-813).
DENMARK:
Agricultural conditions and organisation, 52,917-29, 52,965-6, 52,993-6, 53,012-9, 53,023-8, 53,055-7, 53,063-9, 53,112-34, 53,154-61.
Agricultural societies, (106), 53,009-11, 53,074-6.
Cattle improvement, proceedings, 53,099-107.
Cattle insurance societies, 53,058-62.
Co-operative movement: (104-106), 52,881-903, 52,967-70, 52,997-3,008, 53,029-47, 53,058-62 53,070-3, 53,104-7, 53,111, 53,126-9.
Breeding societies, (105), 52,888, 52,901-3.
Credit Societies, (104), 52,889-90, 52,900, 52,967-8.
Dairy societies, (104, 105, 108), 52,884, 52,897-8, 53,029-47.
Exporting societies, (105, 107-8), 52,909-16.
Milk recording societies, (105), 52,888, 53,104-7.
Production societies, (104-5, 108), 52,888, 53,001-4.
Purchase societies, (105, 106), 52,888, 53,005-8.
Sale societies, (104, 105, 106, 108), 52,888, 52,891-2.
Education:
Adult, 53,087-9.
Agricultural, 53,074-85, 53,095-7, 53,146.
Folk schools, (106-107), 52,908, 53,020-2, 53,070-3, 53,086, 53,090-8.
Primary, 53,140-53, (808-13).
Fertilisers, manufacture of, 52,960-2.
Holdings, fragmentation:
Limit below which land may not be divided, 52,930-1.
Prevention of, 52,906, 52,990-2.
Land, system and taxation of land and agriculture, 52,904-7. 52,930-8, 52,946-58, 52,963-4, 52,971-81, 52,990-2, 53,048-54, 53,135-9, 53,162-8.
Marketing conditions, (107-8), 52,909-16, 53,040-7.
Mortgaging of land, 52,982-9.
Research work, 53,108-10.
Sugar industry, 52,939-45.
Veterinary service, 53,122-3.

FAGAN, Sir Patrick, K.C.I.E., C.S.I.: (41-64), 52,520-52,783.
AGRICULTURAL DEPARTMENT:
increased Expenditure needed, (43), 52,583.
Punjab, establishment of, probably a good financial investment, 52,633-40.
AGRICULTURAL INDEBTEDNESS:
Causes, (46), (47-8), (53-4).
Credit, sources of, (54).
Increase, (54).
Means for lightening burden of debt, (54-5).

FAGAN, Sir Patrick—*contd.*

AGRICULTURAL INDEBTEDNESS—*contd.*
Moneylenders:
Evils of system, (48).
Keeping of accounts by, proposal, (55).
Mortgage and Sale, restriction of right, considerations *re*, (55).
Punjab Alienation of Land Act, object and results of, (55).
Punjab Redemption of Mortgages Act, useful, (55).
Repayment, reasons preventing, (54).
Rural Insolvency measure not advocated, (55).

AGRICULTURAL INDUSTRIES:
Fruit and vegetable culture, scope for, in Punjab, and investigation advocated, (59), 52,579-82.
Industrial concerns, removal to rural areas, little benefit anticipated, (59).
Lac culture and scope for development, (59).
Mango cultivation, investigation advocated, (59).
Need for, and proposals for encouraging, (42), (49), (59), 52,562-70, 52,696-7, 52,734-45.
Requirements, (59).
Sericulture, scope for, (59), 52,577.
Social prejudices and restrictions, (49), (59).
Weaving of artistic materials, proposal, (49), (59), 52,574-8.

AGRICULTURE, as "transferred" subject, question of results, (43-4), 52,584-6.

ANIMAL HUSBANDRY:
Bulls:
Castration, importance of, (59).
Distribution of approved, properly bred bulls of selected indigenous breeds, importance of, (59).
Cattle breeding, control by Veterinary Department desirable, 52,699-701.
Dairy industry:
Combination with tillage, proposal, (44), 52,614-7, 52,671-4.
Development, scope for, and proposals, (44), 52,604-5, 52,614-7.
Fodder crops, increased cultivation desirable and clovers the most promising, (60).
Grazing, facilities in forests, (59).
Improvement of breeds, importance of, (46).
Pasture, need for real pastures, and question of measures for, (44), 52,618-26.
Religious sentiment, drawback of, (43).

CO-OPERATION:
Beneficial results, (61).
Credit Societies, requirements for success, (61-2).
Encouragement of, in all branches needed, (42), (48), (49), (61), 52,571-3.
Government relations with, recommendation, (61).
Joint improvement schemes, opinion *re* legislation on minority, (62).
Non-credit societies in the Punjab, (62), 52,679-80.

CROPS, change from subsistence farming to commercial, need for, (42), 52,521, 52,654-9, 52,695.

CULTIVATION, *Banjar* lands, question of, 52,587-92.

DEMONSTRATION AND PROPAGANDA:
on Cultivator's land, approved, (52).
Experimental farms, visits of parties of cultivators to, useful, (52).
Improvement of practice of cultivators, measures for, (52).

EDUCATION:
Adult, spread of juvenile literacy of first importance, 52,686.

FAGAN, Sir Patrick—*contd.*

EDUCATION—*contd.*
Agricultural:
Adult, best means of, (52), 52,687-8.
Incentives to study, (52).
in Middle schools, proposal, (52), (62).
in Middle vernacular schools, Punjab, 52,641-6.
in Primary schools, proposal, (52), (62).
Requirements and proposals, (42), (47), (52), 52,676-8, 52,708-10.
Teachers should be drawn from agricultural classes if qualified men available, (52).
Two years' leaving certificate course, proposal, (47), 52,676.
Importance of, compared with communications in the Punjab, 52,684-5, 52,711-3.
Nature study, value of, (52).

Primary:
Compulsory:
Attitude of cultivators, (63).
Necessary for universal literacy but obstacles in way of, and question of overcoming, (62), 52,547-56, 52,593-603.
Small proportion of boys passing through fourth class, reason, and question of means of increasing, (63).
Rural, requirements, (62), (62-3).
School farms, value of, (52).
School plots, value of, (52).
Sons of cultivators drawn away from interest in the land, (63), 52,540-1.

FERTILISERS:
Artificial, scope for widespread use of, in Punjab, doubted, (57).
Cattle urine, methods of preservation needed, (58).
Cowdung, use as fuel:
likely to Continue for long time, (58).
Extension of irrigated reserves for fuel considered impracticable, (58), (60), 52,778.
Effect of phosphatic, etc., manures, investigation needed, (57).
Green manuring, probably too expensive for average cultivator, (58).
Natural, increased use of, desirable, (57).
Night soil, better methods of preservation, needed, (57-8).
Sheep folding in Kangra Hills and extension to plains should be considered, (58).
"Stercoral" problem, (58).

FINANCE:
Co-operative mortgage banks advocated for long-term credit, (53).
Credit, need for healthy system of, (42), (48), (53), 52,533-5.
Short-term, Co-operative Credit societies the best means, (48), (53).
Taccavi loans:
Obstacles to greater popularity, and proposals for remedying, (53), 52,536-9.
Value of, but meeting of whole demand for credit by, not possible, (49), (53).

FINANCIAL COMMISSIONERS, relationship to Government, 52,681-3, 52,689-94.

FORESTS:
Afforestation, extent of scope for, (61), 52,753-4.
Agricultural purposes, fullest possible use for, (59).
"*Bir*" or private grass reserves, possibility of number decreasing and extension doubted, (60).
Deforestation of Sewalik Hills, damage to Hoshiarpur district, (60-1).

FAGAN, Sir Patrick—*contd.*
FORESTS—*contd.*
Deterioration:
Attitude of Government and people, 52,756-9.
from Excessive grazing, extent of, (61).
leading to Soil erosion and means of remedying, (60), 52,753-4.
Firewood and fodder supply, question of possibility of increase, (60), 52,778.
Forest Act, 1878, alteration might be desirable, 52,777.
Grazing facilities, (59).
Increase in soil-moisture and rainfall, question of means of, (61).
HOLDINGS:
Consolidation:
Compulsion on minority may become necessary, and proposal *re*, (56), 52,523-6, 52,060-6.
by Co-operative Societies in the Punjab and extension proposed, (45), (49), (56), (62).
by Exchange, desirability of, (45).
Importance of, (56).
"Killabandi" system, Punjab, (56), 52,782-3.
Obstacles in way of, (56).
Settlement of disputes, recommendation *re*, (56).
Fragmentation:
Cause, (44-5).
Evils of, (41-2), (44), (45).
Means for minimising loss from, (42).
Prohibition of, below certain limit, difficulty, 52,649-53, 52,760-2.
Legislation *re* minors, widows, etc., necessary, in future, (56).
Minimum size desirable, question of, 52,608.
Small:
Application of capital, scope for, (42), 52,669-70.
Improvement of conditions of, question of means, 52,746-50.
Mixed farming, question of scope for, 52,672.
IMPROVEMENTS, factors discouraging carrying out of, by landowners, (63).
INDUSTRIAL DEVELOPMENT, not likely for some time to come, (49).
IRRIGATION:
Amount of water required, investigation desirable, (57).
Canal:
Distribution of water:
Complaints heard in the Punjab, 52,714.
Importance of, (57).
Mechanical modules for village outlets, approval of proposal, (57).
Volumetric system, advantages, but difficulties, (57).
Subordinates, corruption question, (57).
present Conditions and requirements, (45-6).
Conservation of moisture in unirrigated areas, importance of, (45-6), 52,609-10.
Department, inclusion of all forms of irrigation under, question of, and objections to, 52,722-30.
in Hissar district, approval of proposed schemes, (56).
Modern lifts and tubes, scope for, 52,715.
Wells, remission of assessment for a period only, of land irrigated from, not a deterrent to sinking of wells in Punjab, 52,731-3.
LAND REVENUE:
Date of payment, question of effect of, and of alteration, 52,773-5, 52,779-81.
Improvements not hindered by, (63).
Proportion of gross produce taken for, 52,770-2.
Settlement:
Fixing of rent along with, question of desirability, 52,751-2.
Literature *re*, co-ordination proposal, (41), 52,667-8.

FAGAN, Sir Patrick—*contd.*

LAND REVENUE—*contd.*
Subordinate officials, agricultural training would be desirable and recruitment of certain number of agricultural college graduates would be approved, 52,702-3.

MARKETING:
Co-operative, development advocated, (50), 52,658.
Cotton, importance of purity, (51).
Export, financing of, by large European firms, (50), 52,528.
Grain:
Elevators:
would be probably Beneficial, (51), 52,532.
certain Distance between, would be necessary, 52,605.
Purity, importance of, (51).
Information to cultivators as to market conditions, &c., proposal, (51).
Mandis, Punjab system, and approval of, (51), 52,529.
Market Committees, representation of growers on, desirable, 52,530-1.
Middlemen, danger of undue multiplication of, rather than of excessive charges, (50).
Systems and proposals for improvement, (50-1).

MIDDLE CLASS YOUTHS, attracting of town-bred youths to agriculture not necessary or desirable, (52).

RESEARCH:
Co-ordination, need for, (43), 52,585-6, 52,648.
Economic inquiries, proposed organisation, (51-2), 52,667-8.
into Indigenous theory and traditional methods, advocated, (52).
Need for, (42), (43), (51).

SOILS, proposed measures for improvement, (57).

STATISTICS:
Average yields:
Payment of fee to cultivator whose field is used for investigation, proposal, (64), 52,546.
Scientific procedure needed, and proposal, (64), 52,763-9.
Estimates of crop yield, extent of accuracy, (64).
Expert agency for scientific treatment of, need for and proposal, (46-7), (64), 52,675, 52,706-7.
Improvement, possibility of, (46-7).
Land Records, opinion *re*, 52,704-5.
Resources, (46).

VETERINARY:
Assistants, need for increased number formerly, 52,628-31.
Civil Veterinary Department, control by Director of Agriculture approved as regards questions of policy, (58), 52,698.
Contagious Diseases:
Legislation, experiment advocated, (58).
Obstacles in way of dealing with, (58).
Development, importance of, for improvement of agriculture, (46).
Protective inoculation, obstacles in way of, (58).
Research, need for, (42), (43).

WELFARE OF RURAL POPULATION:
Agencies for improvement of, question of, 52,717-21.
Economic inquiries:
by Non-officials desirable, and proposals *re*, (63-4), 52,542-5.
Useful if on right lines, and proposals *re*, (63), 52,542-5.

Fertilisers:

ARTIFICIAL:
Adulteration, prevention, proposed measures, *Speyer* (484), 56,407, 56,460.

Fertilisers—*contd.*

ARTIFICIAL—*contd.*

Agricultural Departments' financial resources should be increased for carrying out experimental and demonstration work, *Speyer* (471), (478).

Bagging system, *Speyer* 56,358-61, 56,436-9.

Calcium Cyanamide:

Advantages of, *Greening* (747-8).

Effect upon insect and fungoid pests, *Greening* (748).

Experiments with, proposal, *Greening* (748).

Imports into India, in 1925-26 and 1926-27, *Greening* 58,259.

Manufacture in certain countries, *Greening* 58,266-9.

Suitability for India, *Greening* (747-8).

Use of, in other countries, *Greening* 58,261.

World production, 1913 and at present, *Greening* (747).

Central Bureau of information, opinion *re* Mr. Hutchinson's proposal, *Speyer* 56,365-6.

Central Fertiliser Office, scheme for, *Speyer* (474-5), 56,334-50, 56,365-8, 56,432-5, 56,440-6.

Collaboration between agricultural departments and industry advocated, and proposed method, *Speyer* (472), (473).

Cost of transport and distribution, and handicap of, and proposal, *Speyer* (482), 56,400-1, 56,464-7.

increased Demand anticipated in time, *Speyer* (472).

Demonstrations, need for, *Speyer* (471), (478).

Economic factor, *Speyer* (472), 56,461-2.

Economic use of, need for further research and extent to which experience in other countries applicable, *Speyer* 56,356-7, 56,362-4.

in Egypt, *Shearer* (237).

Evidence of Mr. Hutchinson and Mr. Maurer agreed with, *Speyer* 56,322.

Experimental work by Fertilizer Sales, Ltd., *Greening* 58,257, 58,262-5.

Fertiliser Propaganda Company of India, Ltd., formation of, *Speyer* (481).

Functions of, *Speyer* (477).

Mixed manures, proposal, *Speyer* 56,449-55.

Nitrogen:

Breeding of new types of plants more capable of responding to, possibility of, and need for research, *Speyer* (484).

Economic results in Germany, *Speyer* (482).

Future prospects, *Speyer* (480), 56,396, 56,410-4.

Importance of, *Speyer* (478).

Increased use of, *Speyer* (480).

Production from the air:

Erection of works would be considered by Imperial Chemical Industries if considered advisable, *Speyer* (476).

Possibility investigated but not considered economic under present conditions, *Speyer* (476), 56,351-4, 56,397, 56,410.

Use of, extent, *Speyer* (479).

Price factor, *Speyer* (481-2).

Retail selling organisations, *Speyer* (473-4), (481), 56,232-33, 56,378.

Sale:

through Co-operative societies, *Speyer* 56,387-9.

more Successful in irrigated areas, *Speyer* 56,394-5.

Systems of:

Credit, proposed system with Government assistance, *Speyer* (482-4), 56,424-36.

in Egypt, *Speyer* (483), (486), (487-8), 56,403-6, 56,425-7

Payment when payment received for crops, *Speyer* (482).

in Siam, *Speyer* (484).

Fertilisers—*contd.*

ARTIFICIAL—*contd.*

Scientific experiments, need for, *Speyer* (477).

Sulphate of ammonia:

Addition to night soil, killing of hook-worm by, *Speyer* 56,399.

Consumption in Java and Spain, *Speyer* 56,468, 56,469-70.

former Export to Java, *Speyer* (480).

Export and import and consumption, *Speyer* 56,471-3.

Holding of stocks, *Speyer* 56,456-7.

Indian production, *Speyer* 56,390-1.

Results obtained in Great Britain and Ireland on various crops, *Speyer* (485).

Tata's factory, export from, *Speyer* 56,421-3.

increased Use of, *Speyer* (480).

Use of, in India, and prospects, *Speyer* (472), (479-80), 56,392-5, 56,447-8, 56,458-9.

Use of natural fertilisers complementary to, *Speyer* 56,339-40.

adequate Water supply essential to successful use of, *Speyer* (484).

Widespread use of, in Punjab, scope for doubted, *Fagan* (57).

Cattle urine, methods of preservation needed, *Fagan* (58).

COWDUNG, USE AS FUEL:

likely to Continue for long time, *Fagan* (58).

Extension of irrigated reserves for fuel considered impracticable, *Fagan* (58), (60), 52,778.

increased Demand for, *Speyer* (471).

Economic importance of, *Speyer* (478-9).

Effect of phosphatic, etc., manures, investigation needed, *Fagan* (57).

Green manuring, probably too expensive for average cultivator, *Fagan* (58).

Natural, increased use of, desirable, *Fagan* (57).

NIGHT SOIL:

Addition of sulphate of ammonia to, killing of hook-worm by, *Speyer* 56,399.

Better methods of preservation needed, *Fagan* (57-8).

Plants and plant residues, use of, as manure, *Howard* 53,692-3.

RESEARCH:

Contribution towards, attitude of Fertilizers Sales, Ltd., *Greening* 58,260.

Increase needed, *Speyer* (471).

Necessary before introduction, *Greening* (747).

Scheme for, *Speyer* (475), 56,343-50, 56,367-77, 56,433-5, 56,443-6.

Sheep folding in Kangra Hills and extension to plains should be considered, *Fagan* (58).

"Stercoral" problem, *Fagan* (58).

Fertilizer Sales, Ltd.:

Evidence on behalf of, *see* Greening, C. B., (747-748), 58,245-269.

Experimental work in India, *Greening* 58,257, 58,262-5.

Work and scope of, *Greening* 58,246-56.

Finance:

AGRICULTURAL BANKS:

in Egypt, system, *Shearer* 54,013-24, 54,176-80.

Proposal, *Rowland* (450).

Co-operative mortgage banks advocated for long-term credit, *Fagan* (53).

through Co-operative Societies and rural banks, the best method, *Lindsay* (211-2).

Credit, need for healthy system of, *Fagan* (42), (48), (53), 52,533-5.

Credit system in America, *Foley* 58,090-1.

Short term, Co-operative Credit Societies the best means, *Fagan* (48), (53).

Finance—*contd.*

Taccavi loans:
Obstacles to greater popularity and proposals for remedying, *Fagan* (53), 52,536-9.
Value of, but meeting of whole demand for credit by, not possible, *Fagan* (49), (53).

Financial Commissioners, *see under* **Administration.**

Flax, successful experiments, *Wigglesworth* 54,798.

FLOUD, Sir Francis L. C., K.C.B., Permanent Secretary to the Ministry of Agriculture and Fisheries: (1-6), 52,147-52,335.

AGRICULTURAL DEPARTMENTS in England, Scotland and Ireland, and central controlling body not desirable, 52,251-5.

AGRICULTURAL INDUSTRIES, England, development work of Ministry, (3), 52,229-36.

AGRICULTURAL ORGANISERS, 52,333-5.

AGRICULTURE, COUNCIL OF, England, 52,268-72.

AGRICULTURE AND FISHERIES, MINISTRY OF:
Estimates and staff, 52,305-12.
Organisation, work, etc., (13), 52,149-2332.
Publicity section, work of, (3), 52,192-200, 52,288-90, 5,296-8.
Relations with officers of local authorities, 52,185-90.
Staff, recruitment system, 52,315-23.
Technical experts, 52,277-87, 52,299-300.

ANIMAL HUSBANDRY, work of Ministry, (3), 52,183-6, 52,215, 52,218-23, 52,259, 52,278, 52,324.

DEVELOPMENT COMMISSION:
Relations with Department of Agriculture in Great Britain, 52,256-7.
Relations to Ministry of Agriculture and Fisheries and agricultural education, 52,174-82, 52,210-7.
Success of system, 52,179-82.

EDUCATION, AGRICULTURAL, system under Ministry, (2), 52,164-73, 52,189, 52,210-16, 52,240-1.

FISHERIES, work of Ministry *re*, (3), 52,201.

INTERNATIONAL INSTITUTE OF AGRICULTURE AT ROME:
England, representation of, permanent representatives formerly, not at present, 52,204-6, 52,224-6, 52,239.
Indian interests, provision for, 52,250.
Staff, 52,207.
Value of, to England, 52,203, 52,237-8.
Value of, to India, question of, 53,308-9.

MARKETING, England:
Local Educational Authorities and, 52,228.
National Farmers' Union, work of, 52,227.
Work of Ministry, (2), 52,154-61.

RESEARCH, work of Ministry, (2-3), 52,170-82, 52,260-7, 52,525.

STATISTICS, work of Ministry, (2), 52,151-6.

VETERINARY, England:
Diseases of Animals Acts, 1894 to 1925, operation of, (4-6), 52,202-52,242-5, 52,329-32.
Work of Ministry, (2), 52,162-3, 52-189, 52,259, 52,277, 52,324-32.

Fodder, *see under* **Animal Husbandry.**

FOLEY, Edward A., Ph.D.: 58,067-244, (746), (814-815).

UNITED STATES OF AMERICA:
Agricultural education, 58,099-101, 58,166, (814).
Agricultural Industries, policy of Federal Governments, 58,216-20.

FOLEY, Edward A.—*contd.*

UNITED STATES OF AMERICA—*contd.*
Agriculture:
Central and State Departments, relations, etc., 58,069-244.
Private organisations, 58,146-9.
Cattle disease, method of dealing with, 58,155, 58,169-70, 58,205-7.
Commercial assistants in India, 58,209-12.
Co-operative movement, 58,087-9, 58,121-4, (814).
Cotton, sale under universal standards, 58,067, 58,080.
County Agricultural agents, 58,186-7.
Crop reporting, 58,161-7, 58,195-7.
Demonstration farms, 58,183-5.
Department of Agriculture, staff and scale of pay in, (746), (814-5).
Financing of agriculture, 58,090-1.
Marketing, system, 58,079-86, 58,140-5, 58,168, 58,198-204.
Research, organisation, and finance, 58,070-8, 58,097-137, 58,174-82, 58,224-44, (814-5).
Roads, extension, 58,130-2.
little Trade from India, 58,092, 58,208-12.
Wheat, elevator system, 58,095-6.

Forests:

AFFORESTATION:
Extent of scope for, *Fagan* 52,753-4.
in Neighbourhood of villages, little scope for, *Fagan* (61).
Agricultural purposes, fullest possible use for, *Fagan* (59).
"*Bir*" or private grass reserves, possibility of number decreasing and extension doubted, *Fagan* (60).
DEFORESTATION:
Rainfall not decreased by, but soil-erosion caused, *Walker* (201).
of Sewalik Hills, damage to Hoshiarpur district, *Fagan* (60-1).
DETERIORATION:
Attitude of Government and public, *Fagan* 52,756-9.
from Excessive grazing, extent of, *Fagan* (61).
leading to Soil erosion and means of remedying, *Fagan* (60), 52,753-4.
Firewood and fodder supply, question of possibility of increase, *Fagan* (60), 52,778.
Forest Act, 1878, alteration might be desirable, *Fagan* 52,777.
Grazing facilities, *Fagan* (59).
Increase in soil-moisture and rainfall, question of means of, *Fagan* (61).

FROST, J. E., Director, British Oil and Cake Mills, Ltd.: (295-296), 54,654-54,734.

CASTORSEED, question of demand for, in England, 54,709-17.

COPRA, Malabar, quality, but little received in England (295).

COTTON CAKE, question of future demand for, in England, 54,724.

COTTONSEED, qualities, and comparison with seed from other countries, (295), 53,658-64, 54,726-32.

GINGELLY, value of, (295), 54,691.

GROUNDNUTS:
Blending, 54,677-81.
Coromandel, arrival in broken condition, (295), 54,670-1, 54,681.
Export:
Fixing of standard for, question of, and no desire for, 54,672-6, 54,682-5.
Prospects for, 54,686-90.
in the Shell not advocated, 54,718-23.
Quality, improving, (295), 54,670.
in the Shell, treatment of, formerly, 54,719-22.

FROST, J. E.—*contd.*

LINSEED:
Export, quantity decreasing, (295), 54,696-700.
Improvement, no suggestion, 54,706.
Increased quantity desired, (295), 54,655.
Quality of, (295), 54,656, 54,701-5.

OILSEEDS:
English demand, prospects, 54,693-5.
Marketing, satisfactory experience, (295).

RAPESEED (*toria*), deterioration in later shipments of season, (296), 54,691.

STATISTICS, cottonseed, in Egypt, 54,691.

Fruit growing, *see under* **Agricultural Industries.**

FURSE, Lieutenant-General Sir William, Director, Imperial Institute: (503-508), 56,474-56,569, (528).

EMPIRE MARKETING BOARD, assistance of Imperial Institute, 56,480.

HEMP, work carried out by Imperial Institute, (506), 56,474, 56,494.

HIDES AND SKINS, work of Imperial Institute, (506), 56,474.

IMPERIAL INSTITUTE:
Advisory Council and Technical Committees, (504).
Advisory Council on Oils and Oilseeds, composition of, (528).
Assistance which could be rendered by, to Indian agriculture, (506).
Assistance likely to be less required by India and Dominions in future, 56,490-1.
Bulletin, (505), 56,498-502, 56,514-6, 56,518, 56,526-30.
and Colonial scientific and research service, (505), 56,493.
Conflict of opinion between Dehra Dun and, question of, 56,496-7.
Constitution, 56,481.
Correspondence, 56,518-20.
Enquiries would be forwarded to proper place if not able to be dealt with, 56,483, 56,506, 56,510.
Fees levied from private individuals, not from Governments, 56,524-5.
Financing of, 56,477-80.
Functions, (503), (508).
Future of, 56,492.
Intelligence Section, (504), 56,489.
Work for India, (507).
Investigations Section, (504-5).
Library, 56,503-4.
Link with Empire Marketing Board an avoidance of overlapping, 56,489.
Organisation, (503-4).
no Overlapping with other institutions, 56,482-3.
Public galleries and cinema, (505), 56,479-80, 56,487-8.
Indian Court, need for improvement, and proposal, (507), 56,485-6, 56,511-3.
Withdrawal of Indian contribution, 56,484.
Publicity, need for, 56,476.
Relations with Department of Scientific and Industrial Research, 56,517.
Technical Committees, work carried out on Indian products, (506), (507), 56,474-5, 56,494-5, 56,521-2, 56,523.

OIL INDUSTRY, work by Imperial Institute, (506), 56,474, 56,521-3.

RESEARCH:
proposed Chain of stations in the Colonies, (505).
Colonial Service scheme, (505).

FURSE, Lieut.-General Sir William—*contd.*

SILK, work by Imperial Institute, (506), 56,474, 56,494.

TANNING MATERIALS, work by Imperial Institute, (506), 56,474.

TIMBERS, work by Imperial Institute, (506), 56,474, 56,494.

GAIGER, Professor S. H., F.R.C.V.S., University of Liverpool: (717-718), 57,909-58,066.

Experience, 57,910-1.

ANIMAL HUSBANDRY, CASTRATION:

Compulsory, not practical proposition at present, 58,058-60.

Veterinary assistants could be trained for, by short course, 58,061-2.

LIVERPOOL UNIVERSITY, Veterinary Department, 58,063-6.

MUKTESAR RESEARCH INSTITUTE:

Stabilisation of grant to, proposal, 57,920.

Suitability of, as research station, question of, and comparison with Bareilly, 57,992-8.

Work at, proposal *re*, (718)

RESEARCH, opinion *re* relations with teaching, 57,925.

VETERINARY:

Civil Veterinary Department, control by Director-General with Government of India, advocated and reasons, (717).

Contagious Diseases:

Centralisation of control advocated, (717-8), 57,917-9, 57,974-82, 58,018-28.

Controlling staff, question of, 58,019-21, 58,038-41, 58,044.

Director-General, appointment, scheme, (718), 57,917-9, 57,974-82.

Dispensaries, control by District Boards, and control of contagious diseases by Department, proposal approved, 58,042.

Indian students, opinion *re*, and need for training in England, 57,926-31.

Research in Veterinary schools in provinces, scheme for, (718), 57,920-5, 57,983-91, 57,999-8,017, 58,045-56.

Rinderpest:

Barrier method in South Africa, 57,913.

Immunising campaign, desirability, &c., 58,029-31.

Simultaneous method of inoculation, advantage compared with serum-alone method, 57,912-6, 57,955-76.

Training, opinion *re*, and question of requirements, 57,932-54, 58,032-7.

GEBBIE, Sir Frederick, Kt., C.I.E., and **WARD, Sir Thomas**, Kt., C.I.E., M.V.O.: (554-555), 56,789-56,925.

Previous service, 56,789-93.

ENGINEERING INSTITUTION, 56,851-6.

IRRIGATION:

All-India Irrigation Congress, might be valuable, 56,870-1.

Canals, drainage systems should be included in original projects, 56,888-90.

Conflicting interests of Provinces, &c.:

Arbitration by individual desirable, 56,794-8, 56,806-9, 56,861-3.

Dealing with, by Governor-General in Council preferable to Legislature, 56,839-44.

Bahawalpur dispute, circumstances and method of settlement, 56,799-802, 57,809.

Jumna River case, 56,804.

Madras dispute, 56,802-3, 56,804, 56,805.

Consulting Engineer, position of, and effect of reforms, (554), 56,822-32.

GEBBIE, Sir Frederick and WARD, Sir Thomas—*contd.*
IRRIGATION—*contd.*
Control of Central Government:
Position since Reforms, 56,833-8.
before Reforms, 56,833-8.
Departments:
Relations with Agricultural Departments, 56,820-1, 56,899-900.
Scope advocated for, 56,915-21.
Co-ordination between Provinces:
Desirability, and question of method, (554), 56,876-8.
through Inspector-General formerly, (554), 56,875.
Distribution of water by Volumetric method:
probable Advantage, 56,869.
Difficulties in connection with, 56,883-5, 56,924-5.
Hydro-electric schemes, extent of scope for, 56,886-7.
Information and experience, availability between Provinces, importance of, and question of methods, (554-5), 56,811-3, 56,848-9.
Inspector-General, scope for, 56,857-60.
Placing of agriculture and, under one Minister, question of, 56,901-8.
Progress generally satisfactory, 56,895.
Productive and non-productive schemes, classification question, 56,814-9.
Research, by Provinces, but collection and distribution of information by Government of India advocated, 56,811-3.
Return of canal water to river, question of, 56,891-4.
Rivers, use of, in Bombay, 56,896-8.
Utilisation of small rivers and *nullahs* in connection with small schemes, extent of scope for, 56,845-7.
Water rates, attitude of Canal Department and Revenue Department, 56,909-14.
Well, control by Agricultural Department advocated, 56,872-4.
SOILS, alkali formation, and waterlogging, research by Provinces advocated, 56,879-82.

GOODWYN, J. A., *see* **ROWLAND, G. E.,** *and* **GOODWYN, J. A.,** (146-51), 56,131-56,319.

Grain:
see also Barley, Wheat, etc.
ELEVATORS:
would probably be Beneficial, *Fagan* (51), 52,532.
certain Distance between, would be necessary, *Fagan*, 52,605.
Market information available to cultivators and dealers, *Robson* (374).
MARKETING:
good Prices obtained by cultivators, *Robson* 55,404-8.
Satisfactory, *Robson* (374), 55,401.
System and small number of middlemen employed, *Robson* 55,401-3.
Packing and grading, satisfactory, *Robson* (374).
Purity, importance of, *Fagan* (51).

Gram:
Export, increased supply desirable, *Demetriadi* 54,344.
Export trade, and question as to prospects, *Robson* 55,471-3, 55,519-37, 55,539-42.

GRANTHAM, V. A., representing Messrs. Forbes, Forbes, Campbell and Co.: (582-592), 57,060-57,158).

COTTON:
Crop statistics and forecasts, inaccuracy of, and proposal for improvement, (586), 57,123-8.

GRANTHAM, V. A.—*contd.*

COTTON—*contd.*
Export:
Improved varieties:
Demand for, 57,074.
special Mark or designation for, impracticable and undesirable, 57,073-4.
Mixing of cotton by merchants to secure particular types for, (584-5), 57,118-22, 57,132-37.
Ginning:
Mixing of cotton in, and question of remedy, (584), 57,104-17.
Saw, disadvantages of, 57,100-3.
Gins and presses, licensing of, in Rajpipla and good results of, 57,107-11.
Long staple, question of demand, 57,150-4.
Longer and medium staples, encouragement advocated, 57,093.
Marketing:
Hedge contracts, effect on, and proposals, (585-6), (589-92), 57,070-2.
Information as to market conditions, (585-6).
Open markets with representation of growers on managing committees desirable and question of possibility, (583), 57,075-6.
Passing on of price fluctuations in Bombay to up-country markets, extent of, 57,068.
Premium for quality not always received by cultivators, but importance of, 57,065-7.
Prospects (583).
Picking, leaves in, and need for improvement, (584), 58,094-8.
Punjab 4F, deterioration, 57,141-8.
Short staple, question of extent of demand for, and prospects in future, (582-3), 57,084-92, 57,138-40.
Short staple or long staple, factors governing growing of, 57,068-9.

IMPLEMENTS, improved, Government must initiate measures for introduction of, (589).

INDIAN CENTRAL COTTON COMMITTEE:
Indore Plant Breeding Station, expenditure considered legitimate use of funds, 57,155-8.
Representation of cultivators' interests and point of view, 57,076.

RESEARCH:
Central advisory and executive body with representation of commercial men, proposal, (587-9), 57,079-83.
by Central Government, advocated, 57,077-8.
Co-ordination by central body desirable, (586-9), 57,064.

STATISTICS, statistical assistant attached to staff of Director of Agriculture would be an advantage, 57,126-8.

Grazing, *see under* **Animal Husbandry.**

GREENING, C.D., Manager of the Agricultural Division of Fertilizer Sales, Ltd.: (747-8), 58,245-269.

FERTILIZER SALES, LTD., work and scope of, 58,246-56.

FERTILIZERS:
Calcium cyanamide:
Advantages of, (747-8).
Effect upon insect and fungoid pests, (748).
Experimental work by Fertilizer Sales, Ltd., 58,257, 58,262-5.
Experiments with, proposal, (748).
Imports into India in 1925-26 and 1926-27, 58,259.
Manufacture in certain countries, 58,266-9.
Suitability for India, (747-8).
Use of, in other countries, 58,261.
World production, 1913, and at present, (747).

GREENING, C. D.—*contd.*
FERTILIZERS—*contd.*
Calcium cyanamide—*contd.*
Research:
Contribution towards, attitude of Fertilizers Sales, Ltd., 58,260.
Necessary before introduction, (747).
JAPAN, cyanamide, manufacture and import, 58,266-9.

Groundnuts:
Admixture of dirt, *Steiner* 54,554-6.
Analysis of figures of various descriptions received by Messrs. Jurgens' German and Dutch factories, *Knight* (445-6).
Best quality believed to be consumed locally, not exported, *Steiner* 54,553.
Blending, *Frost* 54,677-81.
Burma, export of cakes, *Swan* 54,914-5.
Chinese, fatty acid content, *Knight* 56,032.
for Confectionary, *Knight* 56,077-8, 56,127-30.
COROMANDEL:
Mixing of ordinary with dry decorticated, and prevention desired, *Knight* 56,021, 56,033.
Quality, reduction of fatty acids and more uniformity of quality desirable, *Knight* 56,017, 56,021-5.
DAMPING OF:
Certain amount of moisture needed, but damping now excessive and drawback of, *Pfister* 54,340-1.
and Loss from, and investigation into, *Lindsay* 53,817, 53,824, 53,829, 53,877.
Results, *Steiner* 54,477.
Survey of position with grant from Empire Marketing Board, *Lindsay* 53,817, 53,824, 53,829, 53,877; *Steiner* 54,477-8.
Deterioration if supply of good seed not maintained, *Steiner* 54,477.
East African exports, *Ormsby Gore* (435).
EXPORT:
Basis of sale in England, *Steiner* 54,609-13.
Coromandel, arrival in broken condition, *Frost* (295), 54,670-1, 54,681.
Distribution of, *Steiner* 54,558-61.
Fixing of standard for, question of, and no desire for, *Frost* 54,672-6, 54,682-5.
Holding of, in India to avoid shipments coinciding with those from other places, would be an advantage, and possible method for preventing deterioration, *Knight* 56,070-5, 56,052-5.
Packing, no improvement in method needed, *Steiner* 54,628.
Position in London market, and scope for increased supply, *Steiner* 54,484-503.
Price, factors affecting, *Steiner* 54,554, 54,578, 54,615.
Prices on London market compared with Chinese and Nigerian, *Steiner* 54,620-5.
Prospects for, *Frost* 54,686-90.
in the Shell not advocated, *Frost* 54,718-23.
Spreading of shipment all over the year would be an advantage but difficult, *Knight* 56,045-55.
Statistics, *Lindsay* (806).
EXTENSION OF CULTIVATION:
Advocated, *Steiner* 54,477, 54,557.
in Some districts, *Steiner* 54,557.
and World prices governed by Indian crop, *Knight* 56,027-30.
Free fatty acids percentage, problem of, and desirability of reducing, *Knight* 56,017, 56,022-4, 56,036-41, 56,081-2, 56,105-7.
High oil content would secure better price, *Steiner* 54,615-6; *Knight* 56,042-4, 56,079-81.

Groundnuts—*contd.*

Khandesh, quality and comparison with Coromandel, *Knight*, 56,034-5, 56,062-9.
Production increasing but supply for export stationary, *Steiner* 54,617-9.
Purchase in London, system, *Knight* 56,018-21, 56,042-3, 56,109-10.
Quality, improvement of, *Steiner* 54,503, 54,550-2, 54,565; *Frost* (295), 54,670; *Knight* 56,026.
Research *re*, advocated, *Steiner* (547), 54,478.
Seeds, supply of good seed to cultivators not the business of merchants, *Steiner* 54,566.
in the Shell, treatment of, formerly, *Frost* 54,719-22.
Shelling, importance of leaving skin intact to prevent nuts turning rancid on voyage, *Steiner* 54,579.
Unshelled, no trade for, *Steiner* 54,645-7.
Weevil, nuts kept in shell until shipment as protection, *Steiner* 54,567.

HALL, Sir Daniel, K.C.B., M.A., F.R.S., Ministry of Agriculture: (87-89), 52,784-52,878.

RESEARCH:
Central organisation, need for, 52,822-5.
Communication of results to farmers, problem of, 52,858-62.
Council of Agricultural Research, scheme for, (87-89), 52,813-31, 52,843-5, 52,849-54, 52,876-8.
in England:
Development Commission, system and possible improvements, 52,793-802, 52,813, 52,820-1.
Effect on quality of farming and profits made by farmers, question of, 52,840-2.
Experimental commercial farms, particulars *re*, and failure, 52,839.
Experimental plots, system, 52,864.
Organisation, 52,820-1, 52,832-8, 52,846-7.
Post-graduate scholarships, system and success of, 52,854-6.
Relationship between Research Institute, Advisory system and Local Education system, 52,848, 52,863-4.
Relationship with teaching, 52,786-92.
Rothamsted Board of Management, composition, meetings, etc., 52,871-8.
Relationship with teaching, 52,786-92.
through Universities and Agricultural Colleges advocated, 52,816.
Workers:
Colonial system of recruitment, 52,866-70.
from England, prospects of obtaining, 52,809-12.
Touch must be kept with practical aims, 52,843-5.
Training, recommendations *re*, 52,805-8, 52,854-7.

Hemp:

Acreage statistics, unreliability of, *Wigglesworth* 54,805-7.
Development, possibilities of, *Wigglesworth* 54,738.
Dust and dirt in, *Advisory Committee on Vegetable Fibres, Imperial Institute* (303); *Wigglesworth* 54,750-4, 54,813-5.
Export:
Badling, need for improvement and proposal, *Advisory Committee on Vegetable Fibres, Imperial Institute* (303, 303-4); *Wigglesworth* 54,764-7, 54,844-5.
Better prices would be obtained by cultivators if in touch with houses of shipment, *Wigglesworth* 54,762.
Complaints by merchants in England, nature of, and steps taken *re*, *Lindsay* 53,811, 53,864-5, 53,873-4.
Form of contract, *Wigglesworth* 54,768-9.
Grading system, *Wigglesworth* 54,755-61.
Packing and grading, memorandum by Advisory Committee on Vegetable Fibres, Imperial Institute, (302-3-5).

Hemp—*contd.*
EXPORT—*contd.*
Prices, *Wigglesworth* 54,808-10.
Fluctuations, *Wigglesworth* 54,792
in London and competition of Russian and Italian hemp, *Lindsay* 53,879-82.
Prospects of development of, and proposals for, *Wigglesworth* 54,738, 54,742-4, 54,781-2, 54,793-5, 54,852-3; *Prain* 54,852.
Standards, imposition not desirable at present, should be left to trade, *Wigglesworth* 54,750, 54,784-5, 54,789-91; *Lindsay* 54,784, 54,791.
Standards of quality and purity prescribed in London, *Wigglesworth* 54,748-9.
IMPROVEMENT:
Co-operation of Agricultural Department, proposal for, *Wigglesworth* 54,779-80.
by Means of cess, and organisation on lines of Indian Central Cotton Committee, proposal, *Lindsay* 54,746, 54,786, 54,823-4, 54,830, 54,836, 54,840-1; *Wigglesworth* 54,822, 54,825-35, 54,836-9.
Improvement in quality of Indian hemp grown in Italy and possibility of like improvement in India, *Wigglesworth* 54,769-71.
Limit of altitude at which growing of, possible, *Wigglesworth* 54,801-4.
Mixing, question of preventing, *Lindsay* 54,786-7.
Quality of, *Wigglesworth* 54,738, 54,742.
Improving on the whole, *Wigglesworth* 54,774.
Reputation on the Continent, *Wigglesworth*, 54,773.
Research, proposal, *Advisory Committee on Vegetable Fibres, Imperial Institute* (305); *Brady* 54,745; *Lindsay* (806-7).
Retting, method and proposal *re*, *Wigglesworth* 54,776-9, 54,811-15.
Soil, importance of preparation, *Wigglesworth* 54,775.
Substitutes, question of, *Wigglesworth* 54,816-21.
Sunn hemp:
Importance of producing good fibre, *Advisory Committee on Vegetable Fibres, Imperial Institute* (304).
Leaflet issued by a Department of Agriculture *re* cultivation, criticism, *Advisory Committee on Vegetable Fibres, Imperial Institute* (304); *Wigglesworth* 54,942-3.
Value of, difference according to period of pulling and retting, *Wigglesworth* 54,746-7.
Variations in quality of fibre not due to plants but to time of cutting and retting, *Advisory Committee on Vegetable Fibres, Imperial Institute* (304); *Prain* 54,852.
Wild, no commercial use possible, *Wigglesworth* 54,796.
Work carried out by Imperial Institute, *Furse* (506), 56,474, 56,494.

HENRY, E., *see* **MALCOLM, Colonel Geo. A., D.S.O., and HENRY, E.**, representing the London Jute Association, 55,174-55,294.

Hides and skins:
Colonial exports, *Ormsby-Gore* (435).
Complaints by merchants in England, *Lindsay* 53,817, 53,824.
Export duty, abolition desired, *Steiner* 54,593.
Work of Imperial Institute, *Furse* (506), 56,474.

Holdings:
CONSOLIDATION:
Compulsion, doubt as to desirability of, *Keatinge* 56,995-7.
Compulsion on minority may become necessary, and proposal *re*, *Fagan* (56), 52,523-6, 52,660-6.
by Co-operative Societies:
in the Punjab and extension proposed, *Fagan* (45), (49), (56), (62).
would be Useless without change in law, *Keatinge* 56,989-91, 57,038-43.

Holdings—*contd.*

CONSOLIDATION—*contd.*
by Exchange, desirability of, *Fagan* (45).
Importance of, *Fagan* (56).
"Killabandi" system, Punjab, *Fagan* (56), 52,782-3.
Obstacles in way of, *Fagan* (56).
Settlement of disputes, recommendation *re*, *Fagan* (56).
Creation of economic holdings which would be permanent and impartible, proposed measures for, *Keatinge* (569-70), 56,937-42, 56,970-3, 56,978-83, 56,990, 57.055.
Diversity in sizes, value of, *Keatinge* (570), 56,950.
Excessive pressure on the soil, *Keatinge* (569), 56,946-7, 56,986-8.
FRAGMENTATION:
Cause, *Fagan* (44-5).
Continuing, *Keatinge* 56,984-5.
in Egypt, *Shearer* 54,111-20.
Evils of, *Fagan* (41-2), (44), (45); *Keatinge* (569), 56,992-3.
Means for minimising loss from, *Fagan* (42).
Prevention of:
in Denmark, *Faber* 52,906, 52,990-2.
Scope for, *Keatinge* 57,044-7.
Prohibition of, below certain limit:
not Advocated, law would be inoperative, *Keatinge* 56,974-6.
in Denmark, *Faber* 52,930-1.
Difficulty, *Fagan* 52,649-53, 52,760-2.
Law of primogeniture, younger sons would remain on land, *Keatinge* 56,977.
Legislation *re* minors, widows, etc., necessary in future, *Fagan* (56).
Minimum size desirable, question of, *Fagan* 52,608.
One acre sufficient to support family in Egypt, *Shearer* 54,033-40, 54,156-7, 54,232-6.
SMALL:
Application of capital, scope for, *Fagan* (42), 52,669-70.
the Great handicap to advancement of agriculture in India, *Goodwyn*, *Rowland* 56,177, 56,205.
Improvement of conditions of, question of means, *Fagan* 52,746-50.
Mixed farming, question of scope for, *Fagan* 52,672.

HOWARD, Albert, C.I.E., M.A., Director, Institute of Plant Industry, Indore, and Agricultural Adviser to States in Central India: (174-186), 53,544-53,706.
Past experience, 53,545-6.
ADMINISTRATION:
superior Agricultural Provincial Services, opinion *re* recruitment to, 53,588-91.
Rural Development, Department of, scheme for, (184-5), 53,550-3, 53,602-3.
AGRICULTURE, as "transferred" subject, advantages of, (185), 53,557-61.
BANGALORE INSTITUTE, reorganisation scheme, (186).
CROPS:
Cotton:
Improvement by hybridisation, scope for, 53,681.
Manure and soil problems in connection with, 53,691-6.
Diseases, problems of, and need for organised research, (180-2).
Improved varieties, question of effect on fertility of the soil, (176), 53,691-5.
Improvement, work should be branch of research, and should not be limited to one crop, 53,642-4.
Jute, organisation on lines of Central Cotton Committee not considered possible, 52,598-601.
Rice cultivation, development by indigenous system, (174).
Rye, cultivation of, 53,702-6.
Sugarcane, method of dealing with diseases, (181-2).

HOWARD, Albert—*contd.*

CROPS—*contd.*
Tobacco:
Commercial prospects, 53,699-702.
Organisation on lines of Central Cotton Committee not considered suitable, 53,697-8.
Wheat, improvement, work *re*, (176), 53,645-6.

CULTIVATION, success of indigenous systems, (174-5).

FERTILISERS, plants and plant residues, use of, 53,692-3.

INDIAN CENTRAL COTTON COMMITTEE:
Grants to Provinces, system, and working of, 53,669-80.
Indore Institute of Plant Industry:
Administration, finance, etc., 53,656-61.
Organisation of work, 53,647-8, 53,662-8.
Organisation of work, 53,647-8.

INDIAN SCIENCE CONGRESS, 53,637-40.

IRRIGATION:
Canal:
Comparison of results with those of rainfall, (177-8).
Deterioration of the soil as result of, and need for research work *re*, (177, 179-80).
Malaria, connection with, (178-9).
Research in connection with, need for, and importance of, (177-80).
Sukkur Barrage, fear of alkali formation, and need for new method of irrigation, (180).

MUKTESAR INSTITUTE, reorganisation scheme, (186).

PUSA INSTITUTE:
Cajanus indicus, work on, 53,613-4.
Continuance as central institute under proposed conditions desirable, 53,577-9, 53,604.
as Higher and post-graduate training institution, proposed development, (186), 53,576, 53,587-91, 53,686-96.
Indian students, quality of, 53,663-6, 53,651-5.
young Indians at, increase of social amenities and breaking down of barriers to free intercourse advocated, (186), 53,684-5.
Management by semi-official body, scheme, (186), 53,564-9.
Reorganisation scheme, (186).
Situation:
Suitability for study of rice, 53,615-6.
Suitability for work on animals, 53,612.
Unsuitability of, for wheat, 53,606-11.
Superior staff, qualifications advocated, (186).

RESEARCH:
Advantages from transfer of agriculture to Provincial control, (185).
Agriculture and science, Presidential address to Indian Science Congress, 1926, (174-183).
Association of teaching with, opinion *re*, 53,592-7.
Central organisation, difficulties in way of, (185), 53,570-5, 53,577.
Central Council for all India, not advocated, 53,581-4.
Co-ordinating agency not desirable, 53,580, 53,584-6.
by Deputy Directors, impossibility, 53,641-2.
Finance and audit, defects of present system, and proposed change, (185).
Organisation:
by Crops, dangers of, 53,641, 53,644, 53,647-50.
Question of, (182-3).
Plant nutrition work by McCarrison and desirability of continuance of, (178-9).
Team-work, advantages and disadvantages, (182-3).

HOWARD, Albert—*contd.*
RESEARCH—*contd.*
Workers:
Knowledge of rural and trade conditions needed, (184), 53,547-9.
Requirements, (185), 53,554-6.
Terms of service not such as to attract men required, 53,562.
Training of, requirements and suggestions, (183), (184), 53,617-32, 53,686-90.

Imperial Bureau of Mycology, Kew:
as Central clearing house of information, *Butler* 53,406-9.
Contact with Colonies, *Butler* 53,407-9.
Finance of, *Butler* 53,327, 53,357, 53,381-2.
Functions, *Butler* 53,406.
Managing Committee, *Butler* 53,323-6, 53,383.

Imperial Chemical Industries, contribution offered towards propaganda and research work in India, *Speyer* (475-6), 56,346-50, 56,408-9.

Imperial Economic Committee, *Elliot* 53,281-4; *Lindsay* 53,906.
Constitution, functions and method of working, *Chadwick* 55,741-3.

Imperial Institute:
ADVISORY COMMITTEE ON VEGETABLE FIBRES:
Communication with Indian authorities, *Wigglesworth* 54,741.
Constitution, *Wigglesworth* 54,739-40.
Letter to Secretaries, Royal Commission on Agriculture, *re* cess on hemp, (305).
Memorandum on packing and grading of East Indian hemps, (302-5).
Advisory Council and Technical Committees, *Furse* (504).
Advisory Council on Oils and Oilseeds, composition of, *Furse* (528).
Assistance which could be rendered by, to Indian agriculture, *Furse* (506).
Assistance likely to be less required by India and Dominions in future, *Furse*, 56,490-1.
Bulletin, and distribution, *Furse* (505), 56,498-502, 56,514-6, 56,518, 56,526-30.
and Colonial scientific and research service, *Furse* (505), 56,493.
Conflict of opinion between Dehra Dun and, question of, *Prain* 56,496-7.
Constitution, *Furse* 56,481.
Correspondence, *Furse* 56,518-20.
Enquiries would be forwarded to proper place if not able to be dealt with, *Furse* 56,483, 56,506, 56,510; *Prain* 56,506.
Fees levied from private individuals, not from Governments, *Furse* 56,524-5.
Financing of, *Furse* 56,477-80.
Functions, *Ormsby Gore* 55,894-5; *Furse* (503), (508).
Future of, *Furse* 56,492.
Intelligence Section, *Furse* (504), 56,489.
Work for India, *Furse* (507).
Investigations Section, *Furse* (504-5).
Library, *Furse* 56,503-4.
Link with Empire Marketing Board and avoidance of overlapping, *Furse* 56,489.
Organisation, *Furse* (503-4).
no Overlapping with other institutions, *Furse* 56,482-3, 56,489.
Public galleries and cinema, *Furse* (505), 56,479-80, 56,487-8.
Indian Gallery, improvement desirable, and proposal, *Lindsay* 53,989; *Furse* (507), 56,485-6, 56,511-3.
Withdrawal of Indian contribution, *Furse* 56,484.
Publicity, need for, *Furse* 56,476.
Rat poison, enquiry *re*, *Prain* 56,506, 56,508.
Relationship of India and, *Lindsay* 53,987-90.

Imperial Institute—*contd.*

Relations with Department of Scientific and Industrial Research, *Furse* 56,517.

Technical Committees, work carried out on Indian products, *Furse* (506), (507), 56,474-5, 56,494-5, 56,521-2, 56,523; *Prain*, 56,522.

Implements:

Agency business for International Harvester Company and Messrs. Wallace Brothers, *Steiner* 54,589-92, 54,648-53.

Boilers, official representative should be appointed in England to approve designs and constants, *Rowland* (450), 56,235-6.

BRITISH MANUFACTURE:

Advantage over Indian manufacture in that no duty paid on implements, but duty paid on raw material, *Rowland* 56,224-5.

Advantages of, and possibility and willingness as regards meeting requirements of cultivators, *Rowland* (448), (451), 56,147-53; *Goodwyn* 56,155, 56,284-5.

American and German competition, extent of, *Rowland* 56,307-10.

Business in Egypt, *Goodwyn* 56,279-81.

Competition, *Rowland* (449), 56,213; *Goodwyn* 56,214-8, 56,287.

Co-operation of Agricultural Department, proposal for, *Rowland*, *Goodwyn* (450), (451), 56,207-11, 56,297-306.

Copying by Agricultural Department of ploughs on which large sums spent on designs, and sale in competition with British made ploughs, *Rowland* (449), 56,297-9; *Goodwyn* 56,234.

Demonstration in India, methods, and particulars re, *Pelly* (624).

Designs, constant changes of, by Directors of Agriculture, *Rowland* (448), (449), 56,183-5; *Goodwyn* 56,157-8, 56,186, 56,269.

Difficulties experienced by manufacturers, *Rowland* (448-9).

Distribution, problem of, *Rowland* (448); *Goodwyn* 56,208-9, 56,214, 56,277.

Export credit facilities, extension to India would assist, *Rowland* (451), 56,221-3.

Foreign competition in other countries, *Goodwyn* 56,317-9.

List of implements specially designed for work in India or specially modified to meet Indian conditions, *Pelly* (627).

Market in India, question of prospects, *Goodwyn* 56,177; *Rowland* 56,181-2.

Method of carrying on business in India and investigations carried out, *Rowland*, *Goodwyn* (447), 56,134-8, 56,237-52, 56,256-67, 56,275.

Number of oxen required for different types published in catalogue, *Goodwyn* 56,175.

Placing of larging orders, prices could be reduced, *Rowland* (448) 56,149.

Ploughs, prices, *Goodwyn* 56,198.

Preference system, criticism of, *Rowland* (447-8), 56,291-6; *Goodwyn* 56,219-20.

Reduction of number of types, question of, *Goodwyn* 56,155-60.

Reduction of railway rates in India would assist, *Rowland* 56,153.

Supply to Departments, handicap of terms of payment, *Rowland* (449).

Supply of parts and making up in India, *Rowland* 56,151; *Goodwyn* 56,152.

Testing of power required, *Goodwyn* 56,176.

Types particularly suitable to India, *Goodwyn* 56,161; *Rowland* 56,161, 56,284.

Demonstration on cultivators' land, *Pelly* (614).

in Egypt, *Shearer* (238); *Goodwyn* 56,279-81.

FOWLER CABLE PLOUGHING TACKLES:

Cost of ploughing, *Pelly* (624), 57,387-93.

Demonstration work in India, *Pelly* (624), 57,379-82.

Implements—*contd.*

FOWLER CABLE PLOUGHING TACKLES—*contd.*
Drainage by, proposals for, *Pelly* (624).
Import duties, *Pelly* 57,373-6.
Success of, in India, *Pelly* (624).
Use of, for improvement of soils, possibilities, Pelly (625-6), 57,379.
Government loans or credit facilities, proposal, *Pelly* (626).

HIRE PURCHASE SYSTEM:
Difficulty of handling of, by manufacturers, must be dealt with by State, *Rowland* 56,142-3, 56,202; *Goodwyn* 56,199-204.
Price would be increased unless carried out by co-operative societies, *Steiner* 54,564.
Hiring out of plant by Government, proposal, *Pelly* (628).
Improved, Government must initiate measures for introduction of, *Grantham* (589).

MANUFACTURE IN INDIA:
by British manufacturers:
Questions in connection with, *Rowland* 56,165-70.
Objections to, *Goodwyn* 56,180.
by Kirloskar Brothers, ploughs, comparison with British, *Goodwyn* 56,178-80.
Central experimental station, objection to proposal, *Goodwyn*, *Rowland* 56,270-75.
Cream separators, little scope for, *Rowland* 56,282-3.

DEMONSTRATIONS:
at Government farms, etc., results disappointing, *Goodwyn* 56,252-3
Scheme, *Rowland* (450).
Distribution through Co-operative societies, obstacles in way of, Goodwyn 56,287-8.
Oil engines, development of business in, by British makers, *Rowland* (450).

PLOUGHS:
All-steel, advantage of, but difficulties in way of introduction at present, *Rowland* 56,171, 56,174; *Goodwyn* 56,174.
Iron, distribution by Departments of Agriculture, statistics, and inadequacy of, *Rowland* (449); *Goodwyn* 56,217.
Splitting of soil by country ploughs instead of inverting, and question of possibility of introducing deep ploughing or combination implement, *Goodwyn*, *Rowland* 56,187-93, 56,311-6.
Total number in India, *Rowland* (449).
Popularisation of, means, *Rowland* 56,139; *Pelly* (626), 57,336-426.
Prime-movers for power water lifts, making of, by British manufacturers, *Rowland* 56,162-4.
Purchase on instalment plan, proposal, *Rowland* (450).
Purchase of, and placing at tenants' disposal by large landowners, proposal, *Rowland* (450), 56,227-30; *Goodwyn* 56,206.
Schools or depots in charge of native instructors in up-country towns, proposal, *Rowland* (450).
Spare parts, difficulties in way of stocking, *Rowland* (449).
Standardisation and mass production, difficulty, *Rowland* (448), 56,160, 56,232-3; *Goodwyn* 56,159-60, 56,268, 56,290.
Types required in India very simple, *Goodwyn* 56,156.

Import Trade, *see under* **Trade.**

Improvements, factors discouraging carrying out of, by landowners, *Fagan* (63); *Keatinge* (569).

Indian Central Cotton Committee:
Financing of, by cess on cotton, *Lindsay* (212).
Grants to Provinces, system, and working of, *Howard* 53,669-80.

Indian Central Cotton Committee—*contd.*

INDORE INSTITUTE OF PLANT INDUSTRY:
Administration, finance, etc., *Howard* 53,656-61.
Expenditure on, considered legitimate use of Committee's funds, *Grantham* 57,155-8.
Organisation of work, *Howard* 53,647-8, 53,662-8.
Organisation of work, *Howard* 53,647-8.
Representation of cultivators' interests and point of view, *Grantham* 57,076.
Success of work and value of unofficial co-operation, *Lindsay* 53,920-2.

Indian Science Congress, *Howard* 53,637-40.

Indian Sugar Committee, recommendations of, and opinion *re*, *Barber* (751), (754), (759-60).

Indian Tea Association:
Composition, functions, etc., *Carmichael* 55,590-5.
Evidence on behalf of, *see* **Carmichael, L. T.,** and **McLeod, Major Norman,** (388-391), 55,580-55,738.
Financing of, by export cess, *Lindsay* (212).
Jorhat laboratory, recruitment of experts, method, *Carmichael*, *McLeod* 55,640-2.

Indigo, *see under* **Crops.**

Industrial development, not likely for some time to come, *Fagan* (49).

International Institute of Agriculture at Rome:
England, representation of, *Flood* 52,204-6, 52,224-6, 52,239.
Indian interests, provision for, *Flood* 52,250.
Staff, *Flood* 52,207.
Value of, to England, *Flood* 52,203, 52,237-8.
Value of, to India, question of, *Flood* 53,308-9.

Iron and steel Industry, protection, *Chadwick* 55,43, 55,840.

Irrigation:
All-India Irrigation Congress, might be valuable, *Gebbie* 56,870-1.
Amount of water required, investigation desirable, *Fagan* (57).
CANALS:
Comparison of results with those of rainfall, *Howard* (177-8),
Deterioration of the soil as result of, and need for research work *re*, *Howard* (177, 179-80).
Distribution of water:
Complaints heard in the Punjab, *Fagan* 52,714.
Importance of, *Fagan* (57).
Mechanical modules for village outlets, approval or proposal, *Fagan* (57).
Volumetric system, advantages, but difficulties, *Fagan* (57); *Gebbie*, *Ward* 56,869, 56,883-5, 56,924-5.
Drainage systems should be included in original projects, *Gebbie*, *Ward* 56,888-90.
Malaria, connection with, *Howard* (178-9).
Subordinates, corruption question, *Fagan* (57).
present Conditions and requirements, *Fagan* (45-6).
CONFLICTING INTERESTS OF PROVINCES, &C.:
Arbitration by individual desirable, *Ward*, *Gebbie* 56,794-8, 56,806-9, 56,861-3.
Bahawalpur dispute, circumstances and method of settlement, *Ward* 56,799-802, 57,809.
Dealing with, by Governor-General in Council preferable to Legislature, *Gebbie* 56,839-44.
Jumna River case, *Ward* 56,804.
Madras dispute, *Ward* 56,802-3, 56,804; *Gebbie* 56,805.

Irrigation—*contd.*

Conservation of moisture in unirrigated areas, importance of, *Fagan* (45-6), 52,609-10.

Consulting Engineer, position of, and effect of Reforms, *Gebbie*, *Ward* (554), 56,822-32.

CONTROL OF CENTRAL GOVERNMENT:
Position since Reforms, *Ward*, *Gebbie* 56,833-8.
before Reforms, *Gebbie* 56,864-7.

CO-ORDINATION BETWEEN PROVINCES, &C.:
Desirability, and question of method, *Gebbie*, *Ward* (554), 56,876-8.
through Inspector-General formerly, *Gebbie*, *Ward* (554), 56,875.

DEPARTMENT:
Co-operation between Meteorological Department and, desirability of, and means, *Walker* 53,741-8.
Inclusion of all forms of irrigation under, question of, and objections to, *Fagan* 52,722-30.
Relations with Agricultural Department, *Gebbie*, *Ward* 56,820-1, 56,899-900; *Keatinge* 56,951-4.
Scope advocated for, *Gebbie*, *Ward* 56,915-21.

Development of major schemes by Government and of small installations by private owners, advocated, *Rowland* (451), 56,231.

in Egypt, *Shearer* (238), 54,054-67, 54,094, 54,164-6, 54,264.

in Hissar district, approval of proposed schemes, *Fagan* (56).

Hydro-electric schemes, extent of scope for, *Gebbie* 56,886-7.

Information and experience, availability between Provinces, importance of, and question of methods, *Gebbie*, *Ward* (554-5), 56,811-3, 56,848-9.

Inspector-General, scope for, *Gebbie* 56,857-60.

Modern lifts and tubes, scope for, *Fagan* 52,715.

Northern Gujarat, conditions, *Keatinge* 57,031-6.

Placing of agriculture and, under one Minister, question of, *Gebbie* 56,901-8.

Prime-movers for power water lifts, making of, by British manufacturers, *Rowland*, 56,162-4.

Progress generally satisfactory, *Gebbie* 56,895.

Productive and non-productive schemes, classification question, *Gebbie* 56,814-9.

RESEARCH:
Central institution for investigation of problems desirable, and staff required for, *Keen* 58,600-3, 58,607-19.
Need for, and importance of, *Howard* (177-80).
by Provinces, but collection and distribution of information by Government of India advocated, *Gebbie* 56,811-3.

Return of canal water to river, question of, *Gebbie* 56,891-4.

Rivers, use of, in Bombay, *Gebbie* 56,896-8.

Sale of fertilisers more successful in irrigated areas, *Speyer* 56,394-5.

SUKKUR BARRAGE:
Alkali formation, fear of, and need for new method of irrigation, *Howard* (180).
Cotton cultivation, question of prospects, *Shearer* 54,210-3.
Effect on wheat export, question of, *Demetriadi* 54,345, 54,347; *Pfister* 54,346-8; *Robson* 55,417.

Utilisation of small rivers and *nullahs* in connection with small schemes, extent of scope for, *Gebbie* 56,845-7.

WATER RATES:
Attitude of Canal Department and Revenue Department, *Ward* 56,909-14.
System in Egypt, *Shearer* 54,057-9.

adequate Water supply essential to successful use of artificial fertilisers, *Speyer* (484).

Irrigation—*contd.*

WELLS:

Control by Agricultural Department advocated, *Gebbie, Ward* 56,872-4.

Remission of assessment, for a period only, of land irrigated from, not a deterrent to sinking of Punjab wells, *Fagan* 52,731-3.

Italy, cyanamide manufacture, *Greening* 58,268.

Japan:

Cyanamide, manufacture and import, *Greening* 58,266-9.

Fertilisers, measures for preventing adulteration, *Speyer* (484).

JARRETT, A. E., of Messrs. Jarrett Brothers, London: (543-544), 56,672-56,788.

TOBACCO:

Burma cheroots, import into United Kingdom, 56,744-55.

Cigarette tobacco, Indian, not to European taste, 56,741-2.

Cigars:

Advertising question, 56,756.

Imports into United Kingdom:

Export to Europe not allowed, 56,743.

Exporting firms, 56,738-70.

Importing firms, 56,727-9, 56,774-5.

Mixing of Indian and foreign tobacco in, (544), 56,678-82, 56,698-701, 56,722.

Pushing of trade in United Kingdom, steps taken, 56,777.

Quality, deterioration, (543), 56,674-9.

practically Stationary since about 1923, 56,730.

Statistics and decline in, (543-4), 56,673, 56,682-9, 56,702-15, 56,778-83.

Markets in other parts of the world, 56,723-6.

Competition of other countries, 56,771-2.

Import duties into United Kingdom:

Change from weight to *ad valorem* basis, question of probable effect, 56,691-6, 56,716-20.

Rates of, and effect, (543, 544), 56,674, 56,682-3, 56,686-90, 56,703-15, 56,731-7, 56,781-8.

Steps taken but without results, 56,778-80.

Raw, imports into United Kingdom, 56,760-9.

Java, cinchona cultivation, *Prain* (509), (510), 56,536-41, 56,555.

JONES, T., Committee of Civil Research, London: (20-21), 52,336-52,379.

COMMITTEE OF CIVIL RESEARCH:

Constitution and functions, (20-1), 52,337-9.

Method of working, and nature of work carried out, 52,340-79.

RAILWAYS, INDIA, enquiry by Committee of Civil Research, 52,364.

JULIUS, G. A., Chairman, Australian Council for Scientific and Industrial Research, (633-653), 57,427-57,579.

AUSTRALIA:

Agricultural administration, (633-53), 57,427-579.

Agricultural training colleges, 57,508-13.

Cattle disease, control, 57,539-40.

Commonwealth Council for Scientific and Industrial research, constitution, working, work, &c., (635-7), (639-53), 57,496-503, 57,429-75, 57,514-34, 57,541-5, 57,558-79.

Co-operation in agricultural research (637-8), 57,440-6, 57,530-1.

Research Administration, &c., (635-53), 57,429-579.

Training and recruitment of research workers, (638), (647-8), (639-53), 57,480, 57,493-5, 57,532-4, 57,546-57.

Jute:

Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
Bales, mixing of qualities in, *Anderson* 55,046.
Colour, dependent on months in which packed, *Malcolm* 55,291-2.
Competition of other textiles, position *re*, *Anderson* 55,046, 55,083-86, 55,151-5.
Complaints by merchants in England, nature of, *Lindsay*, 53,810-1, 53,866.
Contract system, *Anderson* 55,122.
Co-operative marketing, question of effect, *Anderson*, *Scott* 55,144-50.
Correlation of rainfall and outturn, question of possibility, *Walker* 53,756-9.

CROP FORECASTS:
Inaccuracy of, *Malcolm* 55,263-5.
Inaccuracy of, and injury to trade from, *Anderson* 55,046, 55,046-7, 55,073-6, 55,092-3, 55,102, 55,117-9, 55,128-31, 55,156-63.
Damping of, and consequent deterioration on voyage, *Anderson* 55,046, 55,140-3; *Scott* 55,143.
Dundee industry, *Anderson* 55,046, 55,056-64, 55,094-101, 55,110-2, 55,125-7.
Dundee requirements, *Malcolm* 55,219-20.
Export duty, no difference in quantity as result, *Anderson* 55,088-91.
Handling of crop, propaganda among cultivators, need for, and proposal, *Malcolm* 55,178, 55,236.

IMPROVEMENT:
Financing of, from present or extra export duty, proposal, *Malcolm* 55,178, 55,241-51, 55,268.
Organisation for, question of, *Anderson* 55,077-82, 55,102-9, 55,168-9.
Increased production, extent of scope for, *Malcolm* 55,212-4, 55,221, 55,224.
Interests in Great Britain not in direct touch with Agricultural Department in Bengal or jute growers, *Anderson* 55,050-2, 55,069.
London contract, *Malcolm* 55,187, 55,200-2; *Henry* 55,201.
London market, proportion handled on, *Malcolm* 55,215-8, 55,227-30; *Henry* 55,218.
Mixing of, *Malcolm* 55,258-62.
Nature of, *Wiggleswortb* 54,846-50; *Prain* 54,850.
Organisation on lines of Central Cotton Committee:
not considered Possible, *Howard* 52,598-601.
Question of, *Malcolm* 55,241.
Packing, by Indians, need for improvement, and comparison with packing by European shippers, *Malcolm* 55,198, 55,272-81.

PRICES: *Anderson* 55,046.
Comparison with hemp and other fibres, *Malcolm* 55,189-93.
Effect on consumption, *Malcolm* 55,189, 55,204, 55,209-10, 55,225-6.
Effect on production, question of, *Anderson* 55,132-4.
Opinion *re* reasonable price, *Malcolm* 55,222-4, 55,225-6.

QUALITY:
Deterioration, *Anderson* 55,046, 55,053, 55,124; *Malcolm* 55,178, 55,188-9, 55,194-5; *Henry* 55,195-6.
Importance of, *Anderson* 55,046, 55,065-7, 55,135-8; *Malcolm* 55,197.
Improvement of methods of harvesting and cleaning, importance of, and proposals, *Malcolm* 55,231-6, 55,252-5, 55,282-3.
Quantity exported of present crop, *Malcolm* 55,208-9.
Research, need for, and proposal *re* financing and organisation, *Lindsay* (212), 53,979-82, (806-7).
Second-hand trade when prices high, *Anderson* 55,086.

SEED:
Distributed by Bengal Agricultural Department, quality of jute grown from, *Malcolm* 55,178, 55,180-5, 55,256-7; *Henry* 55,182.

Jute—*contd.*
SEED—*contd.*
Government, advantages of, *Malcolm* 55,284.
Improvement, work of Bengal Department of Agriculture and results, *Malcolm* 55,178, 55,180-6, 55,270-1; *Henry* 55,266-7.
Selecting, grading and packing, importance of elimination of irregularities in, *Anderson* 55,046, 55,164-7.
Speculative element in markets, *Anderson* 55,047, 55,073, 55,118-21, 55,130-1.
Stocks, practice *re*, *Malcolm* 55,209, 55,289-90, 55,294.
Substitutes, *Malcolm* 55,178.
Question of, *Anderson* 55,113-6.
TRADE, POSITION:
in 1925 and 1926, *Malcolm* 55,178.
in Different countries, *Malcolm* 55,209-11, 55,287-8.
Type immune from ravages of insects, importance of work on, *Henry* 55,236; *Malcolm* 55,237.
Uses of, *Anderson* 55,046, 55,171-3.

Jute Importers Association, Dundee: *Anderson* 55,049.
Evidence on behalf of, *see* **Anderson, D. A., and Erskine Scott, G.**, 55,046-55,173.

Kapok, non-acceptance by Mercantile Marine Department for life-saving appliances, *Lindsay* 53,811-7, 53,824.

KEATINGE, G. F., C.I.E., I.C.S. (Retd.). (569-570), 56,926-57,059.
AGRICULTURAL DEPARTMENT:
Co-ordination of functions of, and other departments, and question of, 56,955-7, 57,052-4.
Directors of Agriculture, civil or technical, question of, 57,049-51.
Relations with Irrigation Department, Bombay, 56,951-4.
AGRICULTURAL INDUSTRIES, little scope for, 56,948-9.
ANIMAL HUSBANDRY:
Dairying industry, scope for development in Bombay but difficulty, 56,958-64.
Number of cattle greater than normal fodder supply can maintain, (569).
CAPITAL, factors deterring men of enterprise and capital from taking up agriculture, (569).
CROPS, damage by wild pigs, and proposals for destruction, (570).
CULTIVATION, DRY:
in the Deccan, problem, 56,929-36, 56,999-700.
Intensive farming, success would depend on soil, 56,998.
EDUCATION, AGRICULTURAL, Loni School, 57,056.
EMIGRATION to South America, suggestion, 56,946-7, 57,002-17, 57,048.
HOLDINGS:
Consolidation:
Compulsion, doubt as to desirability of, 56,995-7.
through Co-operative movement would be useless without change in law, 45,989-91, 57,038-43.
Creation of economic holdings which would be permanent and impartible, proposed measures for, (569-70), 56,937-42, 56,970-3, 56,978-83, 56,990, 57,055.
Diversity in sizes, value of, (570), 56,960.
Excessive pressure on the soil, (569), 56,946-7, 56,986-8.
Fragmentation:
Continuing, 56,984-5.
Evils of, (569), 56,992-3.
Prevention, scope for, 57,044-7.
Prohibition of subdivision below certain limit not advocated, law would be inoperative, 56,974-6.
Law of primogeniture, younger sons would remain on land, 56,977.

KEATINGE, G. F.—*contd.*

IMPROVEMENTS, factors discouraging carrying out of, by landowners, (569).

IRRIGATION, conditions in Northern Gujarat, 57,031-6.

MIDDLE CLASS YOUTHS, factors deterring, from studying or taking up agriculture, (569).

OVER-POPULATION, (569), 56,946-7, 56,986-8.

SUGARCANE:
- Cultivation, encouragement desirable, if good cultivation, 57,027-30.
- Damage by wild pigs in canal tracts of the Deccan (570).
- Production, increase when price of *gur* increased, and price of *gur* affected by imports of refined sugar, 57,021-7.

VETERINARY, Civil Veterinary Department, combination with Agricultural Department desirable, 56,955-7.

WELFARE OF RURAL POPULATION:
- Economic surveys on large scale preferable, 57,057-8.
- Improvement in material prosperity of Deccan villagers, 56,965-7.
- Means of improving, 56,968-70.

KEEN, Dr. B. A., D.Sc., F.Inst.P., Assistant Director, Rothamsted Experimental Station: 58,597-58,625.

IRRIGATION, Central institution for investigation of problems desirable, and staff required for, 58,600-3, 58,607-19.

RESEARCH:
- Division between central and local, 58,601-3, 58,613-8.
- Workers, training in England, proposals *re*, 58,599.

KNIGHT, Jasper, Managing Director of Messrs. Jurgens, Ltd.: 56,014-56,130, (445-446).

COPRA.
- Export trade, question of prospects, 56,100-4.
- Imports by Messrs. Jurgens, 56,086-9.
- Malabar:
  - Exports, small, 56,100.
  - Quality and use of, 56,089-91.

GROUNDNUTS:
- Analysis of figures of various descriptions received by Messrs. Jurgens' German and Dutch factories, (445-6).
- Chinese, fatty acid content, 56,032.
- for Confectionery, 56,077-8, 56,127-30.
- Coromandel:
  - Mixing of ordinary with dry decorticated, and prevention desired, 56,021, 56,033.
  - Quality, reduction of fatty acids and more uniformity of quality desirable, 56,017, 56,021-5.
- Export:
  - Holding of, in India to avoid shipments coinciding with those from other places, would be an advantage, and possible method for preventing deterioration, 56,052-5, 56,070-5.
  - Spreading of shipment all over the year would be an advantage but difficult, 56,045-55.
- Free fatty acids percentage, problem of, and desirability of reducing, 56,017, 56,022-4, 56,036-41, 56,081-2, 56,105-7.
- High oil content, better price would be given for, 56,042-4, 56,079-81.
- Increased production, and world prices governed by Indian crop, 56,027-30.
- Khandesh, quality and comparison with Coromandel, 56,034-5, 56,062-9.
- Purchase in London, system, 56,018-21, 56,042-3, 56,109-10.
- Quality, believed to have improved, 56,026.

KNIGHT, Jasper—*contd.*

MARGARINE:
English and German market, 56,114-8.
Raw materials used in, 56,016, 56,056-7, 56,111-3, 56,116-7.

VEGETABLE GHI:
Containing animal fat, guarantee against, and no inducement, 56,099.
Industry, 56,119-21.
Manufacture in, and export from, Holland, 56,092-8.

Lac:
Decrease in trade owing to lack of research, *Henry* 55,236, 55,238-9.
Shortage of raw material and consequent increase of synthetic substitutes, *Lindsay* 53,817-9.

Lac culture, *see under* **Agricultural Industries.**

Land, Denmark, system and taxation of land and agriculture, *Faber* 52,904-7, 52,930-8, 52,946-58, 52,963-4, 52,971-81, 52,990-2, 53,048-54, 53,135-9, 53,162-6.

Land Revenue:
Date of payment, question of effect of, and of alteration, *Fagan* 52,773-5, 52,779-81.
Improvements not hindered by, *Fagan* (63).
Proportion of gross produce taken in, *Fagan* 52,770-2.

SETTLEMENT:
Fixing of rent along with, question of desirability, *Fagan* 52,751-2.
Literature *re*, co-ordination proposal, *Fagan* (41), 52,667-8.
Subordinate officials, agricultural training would be desirable and recruitment of certain number of agricultural college graduates would be approved, *Fagan* 52,702-3.

LINDSAY, H. A. F., C.I.E., C.B.E., I.C.S., Indian Trade Commissioner, London: (208-213), 53,775-54,004, 54,735-54,853, (806-7).

Past service, 53,775-6.

AGRICULTURAL DEVELOPMENT COMMISSION, scheme for, (213), 53,976-82.

AGRICULTURAL INDUSTRIES:
Development of cottage industries with electrical power, under consideration, 53,996.
Handwoven silks, scope for, but export through Government Artware Institute desirable, 53,997, 54,001.
Imitation of cottage industry wares in factories, 54,002-4.
Toys, export to England, little scope for, without revision of methods, 53,998.

BRITISH EMPIRE PRODUCERS' ORGANISATION, India not represented on, but representation desirable, 53,991-3.

CROPS, area under various, 1903-4, 1913-14, 1923-24, (805).

DEMONSTRATION, importance of, (209), (211).

DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, functions, 53,780-2.

EMPIRE MARKETING BOARD:
Functions, 53,906.
Grants for institutions, etc., in India, position *re*, 53,828-39, 53,877-8.
Questionnaire on irrigation, 53,876.

FINANCING OF AGRICULTURE, through co-operative societies and rural banks, the best method, (211-2).

HEMP, improvement of production by means of cess, proposal, 54,746, 54,823-4, 54,830, 54,836, 54,840-1.

LINDSAY, H. A. F.—*contd.*

IMPERIAL ECONOMIC COMMITTEE, functions, 53,906.

IMPERIAL INSTITUTE:
Indian Gallery, improvement desirable, 53,989.
Relationship of India and, 53,987-90.

IMPORTS INTO INDIA:
Extent of interest of Indian agriculturists in, Director of Statistics could probably work out, 53,895-7.
Section to which trade goes, etc., question of machinery for watching, 53,900-5, 53,907-11.
Vegetable butter or lard, and question of margarine manufacture in India, 53,935-9, 53,946-8.

INDIAN CENTRAL COTTON COMMITTEE:
Financing of, by cess on cotton, (212).
Success of work and value of unofficial co-operation, 53,920-2.

INDIAN TEA ASSOCIATION, financing of, by export cess, (212).

MARKETING:
Adulteration and mixing, importance of question, (211), (213).
Beans, prussic acid contents question, 53,822.
Bulk storage question, (211).
Cotton:
Complaints by merchants in England, nature of, etc., 53,810, 53,825.
Improvement in condition anticipated, (213).
Mixing of, and measures taken to prevent, 54,786.
Export:
Arbitration between merchants in England and India, 53,931-2.
Complaints by merchants in England, steps taken *re*, 53,824-5, 53,863-6.
Difficulties, (209-10).
Quality and condition of goods, increasing importance attached to, by buyers, (209).
Export and home consumption, proportions, 53,916-7.
Groundnuts, damping of, and loss from, and investigation into, 53,817, 53,824, 53,829, 53,877.
Hemp:
Complaints by merchants in England, nature of, and steps taken *re*, 53,811, 53,864-5, 53,873-4.
Export standard, imposition not advocated, 54,784, 54,791.
Mixing, question of preventing, 54,786-7.
Prices in London and competition of Russian and Italian hemp, 53,879-82.
Hides and skins, complaints by merchants in England, 53,817, 53,824.
Improvement of up-country methods of production and preparation for market, need for, (210), (212).
Information *re* American cotton crop sent to India, 53,941-2.
Information to people as to things which can be profitably exported, question as to, 53,925-8.
Jute, complaints by merchants in England, nature of, 53,810-1, 53,866.
Kapok, non-acceptance by Mercantile Marine Department for life-saving appliances, 53,811-7, 53,824.
Lac, shortage of raw material and consequent increase of synthetic substitutes, 53,817-9.
Oilcake, complaints by merchants in England of presence of castor traces, 53,822-3.
wider and better Organisation of agricultural resources, need for, (209).
Rice, absence of germ, complaint by Haymarket Stores, 53,820-2.

LINDSAY, H. A. F.—*contd.*

MARKETING—*contd.*

Shellac, complaints by merchants in England of adulteration, 53,820.

Tea, improvement in quality, (213).

Tobacco:

Cigar export trade to England, effect of duty on, and question of increasing trade, 53,954-71.

Complaints by merchants in England, 53,817, 53,824.

Wheat:

Bulk storage, no suggestion by trade in England, 54,875.

no Complaints from merchants in England, purity believed to be satisfactory, 53,851-6.

Improvement in condition, (213).

RESEARCH:

Financing of:

by Acreage rate, objection to, 53,858-9.

small Export duty or cess on agricultural exports, and organisations on lines of Indian Central Cotton Committee, proposal, (212-3), 53,840-50, 53,857-62, 53,883-94, 53,923-4, 53,972-82, (806-7).

Importance of, and requirements, (211).

Water hyacinth, proposed research, with grant from Empire Marketing Board, 53,829-36.

TRADE COMMISSIONERS:

in London:

Duties and work of, and office organisation, (208), 53,778-808, 53,931-4.

Information sent out to India by, question as to following up of, 53,870-4.

Officials and institutions corresponded with, in India, 53,867-9.

Removal of office to Grosvenor Gardens, disadvantage of, 53,983-6.

in Other countries desirable, 53,788-90, 53,826-7.

Linseed, *see under* **Oilseeds.**

LITTLEWOOD, J., Oldham Master Cotton Spinners' Association: (364-365), 55,295-55,400.

COTTON:

from Colonies, 55,336-40.

Damping, difficulty caused by, in England, 55,302, 55,303.

Export:

Advertising of Indian cotton, might be increased if quality improved, 55,392-3.

Bales:

400 lb. bale should be maximum, (365), 55,302.

Density of Indian bales compared with American, (365), 55,302, 55,330-5.

Complaints, clearing house for, in England, proposal, (365), 55,307-9, 55,380-1, 55,388-9.

Grading on lines of American universal standards, proposal, (365), 55,225-9, 55,341-7.

Marketing of bales with name of ginnery, desirability of extension of system, (365), 55,310-2.

Price, narrowness of margin in, between Middling American and F.G.F. Tinnevelly and effect, 55,299-300.

Quantity of Indian cotton used in Lancashire, 55,362.

Standard deferred delivery contract, need for, and proposal, (365), 55,304-6, 55,325-9, 55,341-7, 55,384-5.

Style of cotton required by English spinners, (364).

Ginning, need for increased care, and saw gins advocated, (364), 55,354-61, 55,382-3, 55,395-400.

LITTLEWOOD, J.—*contd.*

COTTON—*contd.*
Improved varieties, desirability of being able to distinguish, on the market, 55,296-8, 55,317, 55,324.
Punjab American, deterioration, 55,318-9.
Seed:
Crushing of, trouble caused by, (364).
Deterioration of, (364), 55,318-9, 55,348-53.
Mixing of, (364).
Spinning tests by Oldham Master Cotton Spinners' Association, (365), 55,301, 55,313-6, 55,363-75.
Staple, mixing of, and importance of keeping separate, (364), 55,320.

Liverpool University, Veterinary Department, *Gaiger* 58,063-6.

London Chamber of Commerce, evidence on behalf of, *see* **Demetriadi, Sir Stephen, K.B.E.,** 54,271-54,475.

London Jute Association:
Channels for communication with persons in India, *Malcolm* 55,179, 55,199.
Donation to Bengal Department of Agriculture for improvement of seed, *Malcolm* 55,178, 55,270, 55,286.
Evidence on behalf of, *see* **MALCOLM, Col. G. A., D.S.O.,** and **HENRY, E.,** 55,174-55,294.
Functions, nature of trade, etc., *Malcolm* 55,178, 55,179, 55,203-7.

MacFADYEAN, Sir John, M.B., B.Sc., M.R.C.V.S., LL.D., Principal, Royal Veterinary College, London: (25-28), 52,380-52,519.

AGRICULTURE AND FISHERIES, MINISTRY OF:
Grants for veterinary research, (27), 52,404-8.
Veterinary Adviser, 52,460-1.

ANIMAL HUSBANDRY, improvement of breeds, possible advantage of control by veterinary officers, 52,418-20.

MUKTESAR INSTITUTE:
some Post-graduate teaching should be organised at, 52,516.
Suitability as research centre for India, and transfer of work to the plains undesirable, 52,421-9.

ROYAL COLLEGE OF VETERINARY SURGEONS:
Conducting of examination in India by, impossibility, 52,463-4.
Diploma, extent to which recognised in other countries, 52,465-74
Diploma in Veterinary State Medicine, curriculum, 52,400-3.
Functions, (26), 52,489-90.
Object of, and question of application of system to India, 52,443-6.
Recognition of Indian degree, question of possibility of, 52,394-5, 52,462.

ROYAL VETERINARY COLLEGE, LONDON, quality of Indian students, 52,396-9, 52,438-40.

VETERINARY:
Civil Veterinary Department, control by Director of Agriculture not advisable, (28), 52,384-6.
Contagious Diseases, central control of administration necessary, 52,388-91.
England:
Disease of Animals Acts, administration, (26-7), 52,382-3.
Organisation of service, (25-7), (27-8).
Research staff, prohibition from teaching and drawback of, 52,448, 52,449, 52,502, 52,518-9.
Veterinary surgeons from other countries practising in England not allowed to use title without diploma of Royal College of Veterinary Surgeons, 52,509-12.

MacFADYEAN, Sir John—*contd.*

VETERINARY—*contd.*

Indian qualification, not likely to rank with European diplomas, 52,433-7.

Preventive inoculation:

Serum-alone method *v.* simultaneous method, 52,409-10.

Simultaneous method, disadvantage of, but possibility of avoiding, 52,412-7.

Research:

Concentration in one institute preferable at present to setting up several, 52,506-8, 52,516-8.

in England, (27-28), 52,404-8, 52,447-51, 52,514.

Workers, qualifications required, 52,456, 52,515.

Service, proposed organisation of, 52,476-9.

Surra, question of cure, 52,504-5.

Training:

in Australia, 52,491.

in England:

Colleges, affiliation to Royal College of Veterinary Surgeons would not be possible, 52,430-1.

few Students from Colonies and Dominions, 52,491.

System, (25-27), 52,400-3, 52,441-55, 52,489-91, 52,513.

in Tropical diseases, extent of, 52,502-3.

Four-year course after two years' general science course, opinion *re* proposal, 52,480-5.

Institutions, carrying on of research work in, not advocated, 52,516-8.

Requirements and modifications, opinion *re*, 52,480-8.

Subsequent training in England desirable, 52,432-3, 52,437.

Veterinary Adviser with Government of India, appointment would be approved if suitable man available, 52,457-61.

McLEOD, Major Norman, *see* **CARMICHAEL, L. T.**, and **McLEOD, Major Norman**, Indian Tea Association (London) (388-391), 55,580-55,738.

MacPHAIL, Rev. Dr. E. M., C.I.E., C.B.E., ex-Vice-Chancellor of the University of Madras and ex-Principal of the Madras Christian College: 57,580-57601.

DEMONSTRATION, vernacular leaflets, proposed use of, 57,601.

EDUCATION:

Agricultural:

Madras College, affiliation to University, 57,581.

University courses, danger in connection with, 57,584.

Primary, development, importance of, 57,601.

Universities:

Biological teaching, 57,594-7.

Closer connection with agriculture and research, question of, 57,584-601.

WELFARE OF RURAL POPULATION, economic surveys by Madras University students, collection of information through University organisation preferable to collection by Government, 57,591-3.

Maize, export trade, *Robson* 55,476-9.

MALCOLM, Colonel G. A., D.S.O., and **HENRY, E.**, representing the London Jute Association: 55,174-55,294.

JUTE:

Colour, dependent on months in which packed, 55,291-2.

Crop forecasts, inaccuracy of, 55,263-5.

Export:

Dundee requirements, 55,219-20.

London contract, 55,187, 55,200-2.

MALCOLM, Colonel G. A., and HENRY, E.—*contd.*

JUTE—*contd.*

Export—*contd.*

Mixing of jute, 55,258-62.

Packing, by Indians, need for improvement, and comparison with packing by European shippers, 55,198, 55,272-81.

Proportion handled on London market, 55,215-8, 55,227-30.

Quantity exported of present crop, 55,208-9.

Handling of crop, propaganda among cultivators, need for, and proposal, 55,178, 55,236.

Improvement, financing of, from present or extra export duty, proposal, 55,178, 55,241-51, 55,268.

Increased production, extent of scope for, 55,212-4, 55,221, 55,224.

Organisation on lines of Indian Central Cotton Committee, question of, 55,241.

Prices:

Effect on consumption, 55,189, 55,204, 55,209-10, 55,225-6.

Comparison with hemp and other fibres, 55,189-93.

and Opinion *re* reasonable price, 55,222-4, 55,225-6.

Quality:

Deterioration, 55,178, 55,188-9, 55,194-6.

Importance of, 55,197.

Improvement of methods of harvesting and cleaning, importance of, and proposals, 55,231-6, 55,252-5, 55,282-3.

Seed:

Distributed by Bengal Agricultural Department, quality of jute grown from, 55,178, 55,180-5, 55,256-7.

Government, advantages of, 55,284.

Improvement, work of Bengal Department of Agriculture and results, 55,178, 55,180-6, 55,266-7, 55,270-1.

Stocks, practice *re*, 55,209, 55,289-90, 55,294.

Substitutes, 55,178.

Trade:

Position in 1925 and 1926, 55,178.

Position in different countries, 55,209-11, 55,287-8.

Type immune from ravages of insects, importance of work on, 55,236-7.

LAC, decrease in trade owing to lack of research, 55,236, 55,238-9.

LONDON JUTE ASSOCIATION:

Channels for communication with persons in India, 55,179, 55,199.

Donation to Bengal Department of Agriculture for improvement of seed, 55,178, 55,270, 55,286.

Functions, etc., nature of trade, 55,178, 55,179, 55,203-7.

Mango cultivation, *see under* **Agricultural Industries.**

Manufacturing industries, Indian students in England, work dealt with by High Commissioners' Office, *Chadwick* 55,810-1, 55,813.

Margarine:

English and German market, *Knight* 56,114-8.

Raw materials used in, *Knight* 56,016, 56,056-7, 56,111-3, 56,116-7.

Marketing:

Admixture of dirt, *Chadwick* 55,758.

Adulteration and mixing, importance of question, *Lindsay* (211), (213).

American organisation, *Foley* 58,198-204.

Beans, *see that title.*

Bulk storage question, *Lindsay* (211).

Buying agencies, direct purchase from cultivators, advantage, *Steiner* 54,516-8, 54,521.

Co-operative, development advocated, *Fagan* (50), 52,658.

Control of markets in Egypt by Markets Company, systems, *Shearer* 54,096-100.

Marketing—*contd.*

Cotton, *see that title.*
in Denmark, *Faber* (107-8), 52,909-16, 53,040-7.
in Egypt, system and conditions, *Shearer* 54,096-109.
in ENGLAND:
Local Educational Authorities and, *Floud* 52,228.
National Farmers' Union, work of, *Floud* 52,227.
Work of Ministry of Agriculture and Fisheries, *Floud* (2), 52,154-61.
Evidence by Messrs. Ralli Bros.' representatives in Bombay agreed with, *Pfister* 54,343-4.
EXPORT:
Arbitration between merchants in England and India, *Lindsay* 53,931-2.
Better cleaning, grading and packing, importance of, *Chadwick* 55,758-9.
Complaints by merchants in England, steps taken *re*, *Lindsay* 53,824-5, 53,863-6.
Difficulties, *Lindsay* (209-10).
Financing of, *Fagan* (50), 52,528; *Steiner* (280).
Forward contracts, difficulties experienced, *Steiner* 54,521, 54,572-3.
Grading, inspection, &c., Denmark, *Faber* 52,911-6, 53,040-7.
Quality and condition of goods, increasing importance attached to, by buyers, *Lindsay* (209).
Reputation of Indian produce on European market and suggestions for improvement, *Chadwick* (403), 55,757.
Standards, question of, *Chadwick* (403), 55,760.
Export and home consumption, proportions, *Lindsay* 53,916-7.
Facilities satisfactory, *Steiner* (280), 54,520-2.
Grading system in America, *Foley* 58,079-86, 58,168.
Grain, *see that title.*
Hemp, *see that title.*
Hides and skins, *see that title.*
Improvement of conditions, should be recognised as important function of Agricultural Department, *Chadwick* (402), 55,778-82, 55,793-801.
Improvement of up-country methods of production and preparation for market, need for, *Lindsay* (210), (212).
Information *re* American cotton crop sent to India, *Lindsay* 53,941-2.
INFORMATION TO CULTIVATORS AS TO MARKET CONDITIONS, &c.:
Proposal, *Fagan* (51).
Service satisfactory, *Steiner* (281), 54,635.
Information to people as to things which can be profitably exported, question as to, *Lindsay* 53,925-8.
Jute, *see that title.*
Lac, *see that title.*
Mandis, Punjab system, and approval of, *Fagan* (51), 52,529.
Market Committees, representation of growers on, desirable, *Fagan* 52,530-1.
Middlemen, danger of undue multiplication of, rather than of excessive charges, *Fagan* (50).
Oilseeds, *see that title.*
wider and better Organisation of agricultural resources, need for, *Lindsay* (209).
adequate Premium for quality received by cultivators selling direct, *Steiner* 54,523-9.
Preparation of produce for, improvement, importance of, and duty should be recognised as important function of Agricultural Department, *Chadwick* (402), 55,778-82, 55,816-21.
Rice, *see that title.*
System of, through *sowcars* and *artiyas*, *Steiner* (280), 54,525-8, 54,580.
Systems and proposals for improvement, *Fagan* (50-1).

Marketing—*contd.*

Weights and measures, uniformity would be advantageous but question of possibility, *Pfister*, 54,362-3, 54,366; *Demetriadi* 54,363-6.
Tea, *see that title.*
Tobacco, *see that title.*
Wheat, *see that title.*

Meteorology:

Correlations between rainfall, area and outturn, work *re*, and extent of value of, *Walker* 53,752-9.
Cycles, no value attached to, *Walker* 53,771.
DEPARTMENT:
Co-operation between Irrigation Department and, desirability of, and means, *Walker* 53,741-8.
Functions in connection with agriculture, *Walker* (201-2).
Staff, adequacy of, for provision of ordinary statistical and meteorological data, *Walker* 53,709-13.
Value of, to agriculture, *Walker* (201).
Droughts during last 25 years, *Walker* 53,767-9.
German and Dutch information available to Government of India. *Walker* 53,720.
Mr. Hooker's work on English crops, *Walker* (201-2), 53,762-5.
Inadequacy of data of crops available for correlation with meteorological factors, *Walker* (202), 53,724-5.
Jacob's method of working out correlation coefficients, *Walker* 53,722-3.
LONG RANGE FORECASTS:
Extent of value of, and further work required, *Walker* 53,714-7, 53,749-51, 53,760-1, 53,767, 53,770.
of Floods from melting of snows, not possible at present, *Walker* 53,726-40.
Nile conditions and Indian monsoon conditions, connection, *Walker* 53,772-4.
Upper air conditions, value of measurements of, for weather forecasts, *Walker* 53,717-9.

Middle class youths:

Attracting of town-bred youths to agriculture not necessary or desirable, *Fagan* (52).
Factors deterring, from studying or taking up agriculture, *Keatinge* (569).

Moneylenders, *see under* **Agricultural Indebtedness.**

Mortgage and sale, *see under* **Agricultural Indebtedness.**

Muktesar Institute:

some Post-graduate teaching should be organised at, *MacFadyean* 52,516.
Reorganisation scheme, *Howard* (186).
Stabilisation of grant to, proposal, *Gaiger* 57,920.
Suitability of, as research station, question of, and comparison with Bareilly, *Gaiger* 57,992-8.
Suitability as research centre for India, and transfer of work to the plains undesirable, *MacFadyean* 52,421-9.
Work at, proposal *re*, *Gaiger* (718).

NASH, Vaughan, C.B., C.V.O., Vice-Chairman, Development Commission: (600-606), 57,159-57,335.

CO-OPERATION, in England, Ireland and Scotland, (605).
DEVELOPMENT COMMISSION:
Advantage of system, 57,244-6.
Advisory Committees, (602), 57,168-70.

NASH, Vaughan, C.B., C.V.O.—*contd.*

DEVELOPMENT COMMISSION—*contd.*
Advisory service in connection with colleges, research institutions and farmers, (603), 57,215-7.
Afforestation work, 57,326.
Analogies to, 57,187.
Commissioners, number, meetings, etc., 57,181-6, 57,206-9.
Establishment of, and reasons for, (600), 57,188, 57,191, 57,254-8.
Financial arrangements and position, 57,193-202, 57,234-6.
Functions and position, (600), (601-2), 57,188-92, 57,198, 57,243, 57,321-5.
Grants:
Particulars *re*, (604, 605).
£ for £ system, advantage of, 57,171.
System, (600-3), 57,171-2, 57,175-80, 57,226-42.
Land acquisition powers, (605).
Method of working, (602), 57,166, 57,176-80, 57,218-25.
Public attitude to work of, 57,161-5.
Relations with bodies like Carnegie Trustees and Rockefeller Foundation, (606), 57,172, 57,203-5.
Relations with Road Board, (605-6).
Representation on, and distribution of work between Commissioners, 57,182-4.
Rural industries work, (604), 57,296-300, 57,329-34.
Work of, (603, 604-6).

RESEARCH:
Development Commission principle, question of applicability and method of setting up and working, 57,174, 57,210-4, 57,246-325, 57,335.
England, research institutes and experimental stations, (603).

RURAL COMMUNITY COUNCILS, (605).

Nature study, *see under* **Education.**

Nitram, Limited:
Agricultural Research and Advisory Department, staff, *Speyer* (476), 56,379-86, 56,417-9.
Attitude of agricultural departments, *Speyer* 56,355.
Evidence on behalf of, *see* **SPEYER, F. C. O.** (471-488), 56,320-56,473.
Formation, *Speyer* (481).
Indian staff, *Speyer* (473), 56,379-83, 56,415-8.
Methods of carrying on business, *Speyer* (472-3), 56,328-33
Propaganda and research work by, and results, *Speyer* (472-3), 56,344-6, 56,419-20.

Oil industry, work carried out by Imperial Institute, *Furse* (506), 56,474, 56,521-3; *Prain* 56,522.

Oilcake, complaints by merchants in England of presence of castor traces, *Lindsay* 53,822-3.

Oilseeds:
Areas under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
CASTORSEED, export:
during 1926 and details, *Steiner* (294).
Demand for, in England, question of, *Frost* 54,709-17.

COTTONSEED:
Demand for, *Steiner* (294-5).
Qualities, and comparison with seed from other countries, *Frost* (295), 53,658-64, 54,726-32.
English demand, prospects, *Frost* 54,693-5.

Oilseeds—*contd.*

EXPORT OF OIL AND RETENTION OF CAKE IN INDIA:
Difficulty, *Pfister* 54,398-9.
Exporters would not help to stimulate, *Demetriadi* 54,398.

GINGELLYSEED OR TILSEED:
Decreasing export, but local demand, *Steiner* (295).
Value of, *Frost* (295), 54,691.

LINSEED:
Export, falling off in, *Steiner* (294); *Frost* (295).
Improvement, no suggestion, *Frost* 54,706.
Increased quantity desired, *Frost* (295), 54,655-7.
Marketing, satisfactory experience, *Frost* (295).
Qualities of, *Steiner* (294).
Quality, *Frost* (295), 54,656, 54,701-5.

Rapeseed (*toria*), deterioration in later shipments of season, *Frost* (296), 54,691.

Research, proposal *re* financing of, by export cess, *Lindsay* 53,857, 53,861, (806-7).

Oldham Master Cotton Spinners' Association, evidence on behalf of, *see* **Littlewood, J.** (364-365), 55,295-55,400.

ORMSBY GORE, the Right Hon. W. G. A., M.P., Under-Secretary of State for the Colonies: 55,874-56,013, (435-436).

ANIMAL HUSBANDRY:
Dairy industry in Kenya, 55,957.
Export of cattle, scope for, 55,975-7.
Kenya, crossing of country cattle with imported, 55,891-2, 55,958-9.

COLONIES, agricultural exports, statistics, (435-6).

EDUCATION, Agricultural, in African Colonies, 55,995-6.

EMPIRE MARKETING BOARD, results of advertising work of, and possibility of India sharing in benefit, 56,003-6.

IMPERIAL INSTITUTE, functions, 55,894-5.

PUSA INSTITUTE, bulletins and reports, value of, 55,898.

RESEARCH:
proposed Chain of Colonial stations, 55,931, 55,962-3, 55,990-1.
Colonial Service, scheme, 55,875-9, 55,910-40, 55,945-53, 56,002. 56,007-8.
possible Openings for Indian research workers, 56,002.
in Colonies, organisation of work, 55,999.
Co-ordination between different countries:
Importance of, 55,901-3, 55,999.
Organisation on lines of Imperial Bureau of Entomology, proposal, 55,906-9, 55,960-1, 55,993-4.
Directors, question of relief from routine work, 55,933-6.
Publications:
Bulletin on lines of that published by Imperial Bureau of Entomology desirable, 55,898-9.
Distribution in Colonies, inadequacy of, 55,941-4.
Early communication of results, desirability of, before possibility of publication, 55,900-1.
Interchange between Colonies, etc., importance of, 55,896-7.
Pusa bulletins and reports, value of, 55,898.
Relationship with training, question of, 55,990, 55,992.
Workers, joint conferences of workers in India and the Colonies would be approved, 55,964.

TEA:
Advertising campaign, 56,011, 56,012.
one Organisation would be advantageous, 56,012-3.

ORMSBY GORE, the Right Hon. W. G. A.—*contd.*

TRINIDAD, IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, 55,880, 55,947-50, 55,982-90, 56,008.

VETERINARY:

Colonies, problem and present position *re*, 55,881-93, 55,910, 55,978-81

Preventive inoculation:

no Prejudice against, now, in Colonies, 55,893.

Simultaneous method, use of, in Colonies and results, 55,882-90, 55,971-2.

Rinderpest, dealing with, would be more difficult in India than in Kenya, Nigeria, etc., 55,954-6.

anti-Rinderpest serum, manufacture of, in African Colonies, 55,885, 55,886, 55,965-70, 55,974.

ORR, Dr. J. B., D.S.O., M.C., F.R.S.E., Director, The Rowett Research Institute, Aberdeen: (124-126), 53,167-53,246.

AGRICULTURE, DIRECTORS OF, question of means of relief from administrative work, 53,239-42.

DEVELOPMENT COMMISSION, functions and work of, 53,198, 53,208, 53,210-2, 53,218-22, 53,229-32.

EMPIRE MARKETING BOARD, connection of Rowett Institute with, 53,214-5.

NUTRITION RESEARCH:

Animal and human, advantage of carrying on work in same institute, 53,170-3.

Experiments on animals, results, extent to which indication as regards humans, 53,181-3.

in England:

Cambridge, work, 53,178-80.

Organisation and scope of work, (124-6), 53,169-246.

Position prior to establishment of Rowett and Cambridge Institutes, 53,196-8.

Rowett Institute, Aberdeen:

Applicability of results to Indian conditions, question of, 53,184-6.

Co-operation with India, position *re*, and possibilities, 53,188-95.

Organisation and scope of, &c., (124-6), 53,169-246.

Testing of results in various centres, 52,201-3.

Over-Population, *Keatinge* (569), 56,946-7, 56,986-8.

PELLY, E. Godfrey, of Messrs. John Fowler and Co. (Leeds), Ltd.; (624-627), 57,336-57,426.

CULTIVATION:

Deeper and more thorough cultivation, advantages of, and improvement of soil, by, (624-5).

Pulverisation, advantages of, and advantages of Fowler's cable tackle for, (625).

Tillage, cultivators should be educated to replace ox cultivation by mechanical cultivation with suitable machinery, 626).

Reclamation work, 57,383-6.

IMPLEMENTS:

Demonstration on cultivators' land, (624).

Fowler Cable ploughing tackles:

Cost of ploughing, (624), 57,387-93.

Demonstration in India, methods, and particulars *re*, (624).

Drainage by, proposals for, (624).

Import duties, 57,373-6.

Use of, for improvement of soils, possibilities, (625-6), 57,379.

Use and success of, in India, (624), 57,339-426.

PELLY, E. Godfrey—*contd.*

IMPLEMENTS—*contd.*
Government loans or credit facilities, proposal, (626).
Hiring out of plant by Government, proposal, (626).
Improved, possible means of hastening adoption of, (624-7), 57,336-426.
List of implements specially designed for work in India or specially modified to meet Indian conditions, (627).

SOILS:
Alkali and cultivable land gone out of cultivation, reclamation measures, (625-6), 57,379.
Hariali, Kunda or *Kans* grass, means of eradicating, (625), 57,387-94, 57,408-14.
Improvement, suggestions, (624-5), 57,416.
Uncultivable land, proposed methods of reclamation and improvement, (625), 57,342-9.
Virgin land, proposed methods of preparing, (625), 57,417-20.

Pig-rearing, *see under* **Agricultural Industries.**

PFISTER, H. F., Manager of Messrs. Ralli Bros.: 54,271-54,475.

COTTON:
American competition, 54,319
Damping:
Judicious damping as carried out by natives formerly, beneficial, 54,333.
Prevention, question, 54,334, 54,336, 54,448-54.
Use of hose on cotton and bad effects, 54,333, 54,335.
Punjab-American, question of profit from growing long *versus* short staple varieties, 54,317-9.

CROPS, improvement dependent on enhanced value to grower, 54,317.

GROUNDNUTS, certain amount of moisture needed, but damping now excessive and drawback of, 54,340-1.

MARKETING, evidence by Messrs. Ralli Bros.' representatives in Bombay agreed with, 54,343-4.

OILSEEDS, export of oil and retention of cake in India, difficulty, 54,398-9.

STATISTICS, value of crop forecasts to exporters and earlier publication desirable, 54,367-72.

VEGETABLE OIL, exported to India, certificate of chemical analysis, copy attached, 54,405-6.

WEIGHTS AND MEASURES, uniformity, would be advantageous, but question of possibility, 54,362-3, 54,366.

WHEAT:
Bulk storage and handling, attitude of Messrs. Ralli Bros, 54,314.
Earlier maturing variety desirable, 54,475.
Elevator system and bulk storage probably too costly for internal trade, 54,311.
Elevators:
little Advantage, 54,473-4.
Number of grades required, 54,386.
at Ports and not up-country, not advocated, 54,306-8, 54,555-7.
Export:
Character of wheat exported, change in, owing to local consumption, 54,299-300.
Grading system, 54,286-7.
Increased supply anticipated as result of Sukkur Barrage scheme, 54,346-8.
Mixture of wheat and of soil, 54,309-10.
Sale on "pure" wheat and not "standard" wheat basis, 54,409, 54,467.

PFISTER, H. F.—*contd.*

WHEAT—*contd.*

Organisation on lines of Indian Central Cotton Committee, less suitable than for cotton, 54,278-80.

Pooling system, undesirability of, and reasons, 54,281-5.

Weeviling, 54,309-10.

Poultry-keeping, *see under* **Agricultural Industries.**

PRAIN, Lieut.-Colonel Sir David, C.M.G., C.I.E., F.R.S.: (508-11), 56,474-56,569.

CINCHONA CULTIVATION:

Desirability of, in India, on large scale, considerations in connection with, (508-11), 56,533-69.

in Java, (509), (510), 56,536-41, 56,555.

HEMP:

Export, prospects of development and proposals for, 54,852.

Variations in quality of fibre not due to plants but to time of cutting and retting, (304), 54,852.

IMPERIAL INSTITUTE:

Oil industry, work, 56,522.

Rat poison, inquiry into, 56,506, 56,508.

JUTE, 56,850.

Pulses, export trade, *Robson* 55,474-5.

Punjab Alienation of Land Act, *see under* **Agricultural Indebtedness.**

Punjab Redemption of Mortgages Act, *see under* **Agricultural Indebtedness.**

Pusa Research Institute:

Bulletins and reports, value of, *Ormsby Gore* 55,898.

Cajanus indicus, work on, *Howard* 53,613-4.

Cattle breeding work, doubt as to suitability for, *Butler* 53,350, 53,448-51, 53,476-7.

Cattle farm, value as experimental station not considered very high, *Shearer* 54,186-7.

as isolated Central institute for fundamental research, proposal, *Butler* 53,359-64, 53,384-9, 53,396-7.

Conferences, proposal, *Chadwick* (405).

as Constituent College of University not desirable, but arrangement for students to get degrees by presentation of theses would be approved, *Butler* 53,376, 53,398-405.

Continuance as central institute under proposed conditions desirable, *Howard* 53,577-9, 53,604.

Continuance of, but not as Government institution, scheme and proposed constitution of Board of Management, *Butler* (147), 53,322-3, 53,328-38, 53,342-3, 53,367-71, 53,394, 53,435-40, 53,453-5.

Council, opinion *re* efficiency of, *Butler* 53,375.

Direct contact with provincial workers, importance of, and question of method, *Russell* 58,438-9, 58,467, 58,497-500, 58,526-9.

DIRECTOR:

Administrative work, proposals for relief from, *Butler* 53,456-61.

Communications with Agricultural Adviser, work *re*, and proposed change, *Butler* 53,458-67.

Whole-time, proposed under scheme, *Butler* 53,336, 53,360-1.

Division of functions between Provincial Institutes and, proposal, *Butler* 53,350-2, 53,472-5.

Financing, proposal, *Butler* 53,353-4, 53,468-71.

as Higher and post-graduate training institution, proposed development, *Howard* (186), 53,576, 53,587-91, 53,686-96.

young Indians at, increase of social amenities and breaking down of barriers to free intercourse advocated, *Howard* (186), 53,684-5.

Pusa Research Institute—*contd.*

Management by semi-official body, scheme, *Howard* (186), 53,564-9.
Meetings and conferences at, should be encouraged, *Butler* 53,362.
Original scheme, *Butler* (147-8).
Output and quality of research, believed to have declined and possible reasons, *Butler* (146), 53,318-21, 53,444-5.
Position of, *Butler* (146-7).
Position of, in Agricultural Department, *Butler* (147-150).

POST-GRADUATE TRAINING:
Indian students, quality of, *Butler* 53,343-9, 53,430-4, 53,441-2; *Howard* 53,633-6, 53,651-5.
Results and recommendation *re*, *Butler* (150), 53,365-6, 53,398-405.
Reorganisation scheme, *Howard* (186).

SITUATION:
Drawbacks of, *Shearer* 54,183-5.
Handicap of, and Jubbulpore would be better, *Butler* (147), 53,478-90.
Suitability of, for dealing with problems of tropical India, question of, *Russell* 58,436.
Suitability for study of rice, *Howard* 53,615-6.
Suitability for work on animals, *Howard* 53,612.
Unsuitability of, for wheat, *Howard* 53,606-11.

STAFF:
Higher research staff, English officers necessary for considerable period, and question of possibility of obtaining, *Butler* (147), 53,414-29.
Recruitment, desirable age, *Russell* 58,479.
Reductions, *Butler* (146), 53,445, 53,469-71.
Superior staff, qualifications advocated, *Howard* (186).
Work, attempt to cover too wide a field, *Butler* 53,446-51.

Quinine, Cinchona Cultivation:

Desirability of, in India, on large scale, considerations in connection with, *Prain* (508-11), 56,533-69.
in Java, *Prain* (509), (510), 56,536-41, 56,555.

Railways, *see under* **Administration.**

Ralli Bros., evidence on behalf of, *see* **DEMETRIADI, Sir Stephen, K.B.E.; PFISTER, H. F.; TAYLOR, C. N.;** *and* **WILLSON, L.,** 54,271-54,475.

Research:

Advantages from transfer of agriculture to Provincial control, *Howard* (185).
Agriculture and science, Presidential address to Indian Science Congress, 1926, *Howard* (174-183).
Agronomist, qualifications required, *Russell* 58,417-8.
American organisation, *Foley* 58,070-8, 58,097-137, 58,174-82, 58,224-44, (814-5).
in Australia, administration, etc., *Julius* (635-53), 57,429-579.
Canadian organisation, (279); *Wilson* (529-32), 56,573-93, 56,659-61.
Central advisory and executive body with representation of commercial men, proposal, *Grantham* (587-9), 57,079-83.
Central Clearing house of information on lines of Imperial Bureau of Mycology, question of, *Butler* 53,409-13.
Central control, desirability of, and deterioration in wheat since agriculture a transferred subject, *Demetriadi* 54,274-5, 54,316, 54,349-50.
Central Council for all India, not advocated, *Howard* 53,581-4.
by Central Government advocated, *Grantham* (587-9), 57,077-8.

CENTRAL ORGANISATION:
Difficulties in way of, *Howard* (185), 53,570-5, 53,577.
Need for, *Hall* 52,822-5.

Research—*contd.*

Central stations, desirability of, factor of shortage of first-class workers, *Russell* 58,441-3.
Colonial Office Advisory Council system, question of application to India, *Butler* 53,372-4.

COLONIAL CHAIN OF RESEARCH STATIONS, SCHEME: *Elliot* (137), 53,285-9; *Ormsby Gore* 55,931, 55,962-3; *Furse* (505), 55,990-1.
Administration, *Butler* 53,323, 53,328.
Indian co-operation, question of, *Elliot* (137), 53,268, 53,313; *Butler* 53,328-30.
in Northern Queensland, position *re*, *Julius* 57,535.
Colonial Service, scheme, *Elliot* (137), 53,262-7, 53,289-4; *Ormsby Gore* 55,875-9, 55,910-40, 55,945-53, 56,000-2, 56,007-8; *Furse* (505).
possible Openings for Indian research workers, *Ormsby Gore* 56,002.
Supply of workers, recruitment system, and question of prospects, *Wood*, *Engledow* 57,603-5, 57,642-6, 57,671, 57,683-99, 57,721-2, 57,728.
in Colonies, organisation of work, *Ormsby Gore* 55,999.
Communication of results to farmers, problem of, *Hall* 52,858-62.
Conferences with experts from outside India, suggestion, *Chadwick* (405), 55,761-3.

CO-ORDINATING AGENCY:
not Advocated, voluntary contact preferable, *Butler* 53,342, 53,390-4.
not Desirable, *Howard* 53,580, 53,584-6.

CO-ORDINATION:
by Central body, desirable, *Grantham* 57,064.
Importance of, and scheme, *Chadwick* (404-5), 55,740, 55,771-7, 55,846, 55,854-5, 55,863-4; *Grantham* (586-9).
Need for, *Fagan* (43), 52,585-6, 52,648.

CO-ORDINATION BETWEEN DIFFERENT COUNTRIES:
Importance of, *Ormsby Gore* 55,901-3, 55,999.
Organisations on lines of Imperial Bureau of Entomology, proposal, *Ormsby Gore* 55,906-9, 55,960-1, 55,993-4.

COUNCIL:
Possibility of, and functions, *Butler* 53,339-41, 53,395.
Scheme for, *Hall* (87-89), 52,813-31, 52,843-5, 52,849-54, 52,876-8.
in Denmark, *Faber* 53,108-10.
by Deputy Directors, impossibility, *Howard* 53,641-2.
Development Commission principle, question of applicability and method of setting up and working, *Nash* 57,174, 57,210-4, 57,246-325, 57,335.
Directors, question of relief from routine work, *Ormsby Gore* 55,933-6.
Distribution between provincial and central, *Chadwick* 55,765-70; *Keen* 58,601-3, 58,613-8.
Duplication, advantage of, if not excessive, *Russell*, 58,396-7.
Economic inquiries, proposed organisation, *Fagan* (51-2), 52,667-8.
in Egypt, *Shearer* (237), 54,237, 54,261.
Effect of Egyptianisation of service on, *Shearer* 54,218-27.
Elasticity, need for, and method of achieving, *Russell* (775), (779), 58,514-6.

IN ENGLAND:
Committee of Civil Research: *Elliot* 53,254.
Constitution and functions, *Jones* (20-1), 52,337-9.
Method of working, and nature of work carried out, *Jones* 52,340-79.
Development Commission, *see that title.*
Effect on quality of farming and profits made by farmers, question of, *Hall* 52,840-2.
Experimental commercial farms, particulars *re*, and failure, *Hall* 52,839.
Experimental plots, system, *Hall* 52,864.

Research—*contd.*

IN ENGLAND—*contd.*

Nutrition:

Cambridge, work at, *Orr* 53,178-80; *Wood* 57,741-6.

Organisation and scope of work, *Orr* (124-6), 53,169-246.

Position prior to establishment of Rowett and Cambridge Institutes, *Orr* 53,196-8.

Rowett Institute, Aberdeen:

Applicability of results to Indian conditions, question of, *Orr* 53,184-6.

Co-operation with India, position *re*, and possibilities, *Orr* 53,188-95.

Organisation and scope of, etc., *Orr* (124-6), 53,169-246.

Testing of results in various centres, *Orr* 52,201-3.

Organisation, *Hall* 52,820-1, 52,832-8, 52,846-7.

Post-graduate scholarships, system and success of, *Hall* 52,854-6.

Relationship between Research Institute, Advisory system and Local Education system, *Hall* 52,848, 52,863-4.

Relationship with teaching, *Hall* 52,786-92.

Research institutes and experimental stations, *Nash* (603).

Veterinary, *see that title.*

Work of Ministry of Agriculture and Fisheries, *Floud* (2-3), 52,170-82, 52,260-7, 52,325.

Entomology, central carrying out of work advocated, *Chadwick* 55,770.

Experimental farms, system in Canada, *Wilson* 56,623-35.

Finance and audit, defects of present system, and proposed change, *Howard* (185).

Financial problem, *Russell* (779).

FINANCING OF:

by Acreage rate, objection to, *Lindsay* 53,858-9.

Allotment of fixed sum annually or establishment of fund, proposal, *Chadwick* (405).

in America, *Foley* 58,101-20, 58,125-9, 58,136-7 (814).

in Australia, *Julius* (646-7), (649-53), 57,430, 57,448-54, 57,463-74, 57,562-6.

Central fund, scheme, *Chadwick* (404-5), 55,764-70, 55,858-62.

by Export cesses, approved for particular trades but not for agricultural produce generally, *Chadwick* 55,865-7.

small Export duty or cess on agricultural exports, proposal, *Lindsay* (212-3), 53,840-50, 53,857-62, 53,883-94, 53,972-82, (806-7).

Importance of, and requirements, *Lindsay* (211).

into Indigenous theory and traditional methods advocated, *Fagan* (52).

MYCOLOGY:

Central carrying out of work, proposal, *Chadwick* 55,770.

present Staff inadequate and extent of increase desirable, *Butler* 53,377-9.

National Research Council, America, functions, *Butler* 53,340-1.

Need for, *Fagan* (42), (43), (51).

NUTRITION:

Animal and human, advantage of carrying on work in same institute, *Orr* 53,170-3.

in Australia, *Julius* 57,437-9, 57,489-92.

Central organisation desirable, *Chadwick* 55,768.

in England, *see under* England *above.*

Experiments on animals, results, extent to which indication as regards humans, *Orr* 53,181-3.

ORGANISATION:

by Crops:

Dangers of, *Howard* 53,641, 53,644, 53,647-850.

Proposed, *Biffen* 57,830-2.

Research—*contd.*

ORGANISATION—*contd.*

on Lines of Indian Central Cotton Committee for other crops, scheme, *Lindsay* (212-3), 53,840-50, 53,857-62, 53,883-94, 53,923-4, 53,972-82.

Question of, *Howard* (182-3).

Organisation of, as aid to agriculture, *Russell* (774-9).

Overlapping, not a drawback, *Butler* 53,397.

Plant nutrition work by McCarrison and desirability of continuance, *Howard* (178-9).

Pusa Research Institute, *see that title.*

PUBLICATIONS:

Bulletin on lines of that published by Imperial Bureau of Entomology desirable, *Ormsby Gore* 55,898-9.

Distribution in Colonies, inadequacy of, *Ormsby Gore* 55,941-4.

Early communication of results, desirability of, before possibility of publication, *Ormsby Gore* 55,900-1.

Interchange between Colonies, etc., importance of, *Ormsby Gore* 55,896-7.

Interchange between provinces and with other countries, *Chadwick* 55,847-56.

Pusa bulletins and reports, value of, *Ormsby Gore* 55,898.

Relationship with teaching, opinions *re*, *Hall* 52,786-92; *Howard* 53,592-7; *Ormsby Gore* 55,990, 55,992; *Russell* 58,406-9, 58,566-7; *Wood* 57,735-40; *Biffen* 57,786-7; *Buxton* 57,860-1; *Gaiger* 57,925.

Requirements, *Butler* (149).

Stations, direction and administration of, *Russell* 58,429-30, 58,444-6, 58,589-96.

TEAM-WORK:

Advantages and disadvantages, *Howard* (182-3).

Need for, *Russell* (775), 58,535-6.

Training in Cambridge University, *Wood*, *Engledow* (677).

through Universities and Agricultural Colleges advocated, *Hall* 52,816.

Veterinary, *see that title.*

WORKERS:

Agricultural College course not considered necessary, *Russell* 58,404-5.

Colonial system of recruitment, *Hall* 52,866-70.

Deterioration with age, tendency, *Russell* (779), 58,472-3.

from England:

Long-term engagements would be preferred, *Wood*, *Engledow*, 57,603.

Prospects of obtaining, *Hall* 52,809-12.

possible Supply, question of, *Wood*, *Engledow* 57,603-5, 57,647-51, 57,710-1, 57,717, 57,730.

European, short term engagements might be desirable for juniors, long term necessary for seniors, *Russell* 58,440, 58,482.

Joint conferences of workers in India and the Colonies would be approved, *Ormsby Gore* 55,964.

Knowledge of rural and trade conditions needed, *Howard* (184), 53,547-9.

Qualifications required, *Russell* (775).

Recruitment from schools of pure science and not from agricultural colleges advocated, *Russell* 58,466, 58,504-7.

Recruitment and training in Australia, *Julius* (638), (647-53). 57,480, 57,493-5, 57,532-4, 57,546-57.

Requirements, *Howard* (185), 53,554-6.

Rural upbringing desirable, *Butler* 53,430-4, 53,443.

Supply, question of, *Russell* 58,559, 58,604-5.

Terms of service not such as to attract men required, *Howard* 53,562.

Touch must be kept with practical aims, *Hall* 52,843-5.

Research—*contd.*

WORKERS—*contd.*

Training:

in Canada, *Wilson* (527).

in England, proposals *re*, *Keen* 58,599.

Period abroad after courses in pure science completed, proposal, *Russell* 58,399-403, 58,428, 58,462-3.

Recommendations *re*, *Hall* 52,805-8, 52,854-7.

Recommendation *re*, and proposals *re* training abroad, *Engledow*, *Wood* 57,625-9, 57,669-75, 57,718-20, 57,723-5, 57,730-4.

Requirements and suggestions, *Howard* (183), (184), 53,617-32, 53,686-90.

Rhea, demand for, formerly, but no great production, *Wigglesworth*, 54,799-800.

Rice:

Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).

Bulk shipping not suitable for, *Swan* 54,892-3, 55,009-11.

BURMESE:

Appearance of grain, importance of, in London market, *Swan* 54,935-41, 54,957-69.

Beelugyum paddy, *Swan* 54,926.

Demonstration farms, proposal, *Swan* 54,871-2, 54,884, 54,928-34, 55,036-8.

Export:

Duty, *Swan* 54,904-5, 54,949-50.

to Europe, distribution, *Swan* 54,894-5.

London market, contract system, *Swan* 54,885-7.

Proportion, *Swan*, 54,986.

Quality demanded, *Swan* 54,991-3.

Spanish rice, increased demand for, in England, *Swan* 55,019-22.

percentage of Unhusked grain left in, *Swan* 54,998-9.

to United Kingdom, decreased demand for, and reasons, *Swan* (321), 54,863-8.

Units of Shipment, *Swan* 54,951-3.

Hand hullers, little scope for, *Swan* 55,027-31.

Improvement:

Scope for, *Swan* 55,034-5.

by Selection of grain and improved methods of cultivation advocated, *Swan* (320).

Improvements carried out by Agricultural Department and premiums given on, *Swan* 54,860, 54,919-21, 54,984-5.

Inferior, export to India, *Swan* 54,982.

Japan type, suitability, *Swan* 54,927.

Marketing:

Facilities satisfactory, *Swan* (321).

Internal organisation of, *Swan* 54,881.

Premium paid for quality, but not necessarily received by cultivators, *Swan* 54,882-4.

Units of measurement, *Swan* 54,879-80.

Organisation on lines of Indian Central Cotton Committee, carrying out of work by Government would be preferred, *Swan* 54,873-7.

Pearling of, *Swan* 55,000-7.

Prices, *Swan* 54,973-6, 54,989-90.

Quality, inferiority of, to rice from other countries, and need for improvement, *Swan* (320, 321), 54,860-2, 54,866-8.

Reputation in European markets, lowness of, *Swan* 54,859-62.

Research necessary, *Swan* 54,970-2.

Rice bran, import into England, *Swan* 54,896-9.

Selection of seed grain, importance of, and proposals *Swan* (320), 54,854-7, 54,871, 54,928-34.

Rice—*contd.*

BURMA—*contd.*
Specifications could be given to breeders attempting to meet various European demands, *Swan* 55,013-8.
Sughundi grain, *Swan* 54,860, 54,925.
Varieties, *Swan* 54,988.
Cultivation, development by indigenous system, *Howard* (174).
Export statistics, *Lindsay* (806).

GERM:
Absence of, complaint by Haymarket Stores, *Lindsay* 53,820-2.
Question of, *Swan* 55,023-6.
Improvement, scope for Agricultural Department, *Swan* 54,983, 55,034-5.
Improvement of methods of cultivation desirable, *Swan* (321).
Patna, export, development possibility, *Swan* 54,947-8, 54,963.
Polishing of, effect, *Swan* 55,033.
Japanese importation, effect on market, *Swan* 54,942-6.
Milling and pearling, effect of, *Swan* 55,044-5.
Movements of, *Swan* 54,978-81.

RESEARCH:
Central station, not advocated at present, *Barber* 58,388.
Proposal *re* financing, *Lindsay* (212-3), 53,840-1, 53,857-62, 53,893-4.
World demand, prospects, *Swan* 54,869-70.
Yield, question, *Swan* 54,994-6.

ROBSON, Sir Herbert, K.B.E., of Messrs. Ross T. Smyth and Co., Ltd.: (374), 55,401-55,579.

BARLEY export trade:
Position, 55,457-63, 55,468-70, 55,573-7.
Statistics of, in 1913, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 55,452-6, 55,464-7.

GRAIN:
Export:
Marketing, satisfactory, (374), 55,401.
Packing and grading, satisfactory, (374).
Market information available to cultivators and dealers, (374).
Marketing in India:
good Prices obtained by cultivators, 55,404-8.
System and small number of middlemen employed, 55,401-3.

GRAM, export trade, and question of prospects, 55,471-3, 55,519-37, 55,539-42.

MAIZE, export trade, 55,476-9

PULSES, export trade, 55,474-5.

WHEAT:
Australian, freight to London and to India, 55,431-4.
Blending of, in milling, 55,410-12, 55,429-30, 55,483, 55,516.
steady Deterioration of quality, not agreed with, 55,431-2.
Earlier ripening variety, question of, 55,543-4.
Elevators, not considered desirable in view of state of export trade, 55,440-3, 55,448.
English, comparison with Canadian, 55,498-503.
Export:
1924, purchase of Australian wheat to replace, 55,579.
Admixture of barley, dirt, etc., improvement and small amount of, at present, 55,422-3.
Bales, 492 lbs., change from, as unit, 55,489-90.
possible Cessation of, in the future, 55,491-4.
Decrease owing to increased consumption in India and poor harvests, 55,413-6.
Effect of Sukkur barrage scheme, question of, 55,417.

ROBSON, Sir Herbert—*contd.*
WHEAT—*contd.*
Export—*contd.*
to England:
Australian competition, 55,449-51.
Filling of gap by Indian Wheat, 55,449-51, 55,516-8.
Forward buying, method, 55,444-7.
London Corn Trade Association contract, 55,422, 55,425, 55,435-9.
Marketing on European markets, system, (374).
Quality compared with Canadian and Argentine wheat, 55,424.
not Sufficient now to have much effect on world prices, 55,561-71.
Glutinous, production in India not possible, 55,514-5.
Grading, not advocated, 55,485-8.
Holding up of stock by cultivators, not desirable policy, 55,554-9, 55,571-2.
Imports of Australian wheat to India, 55,471-21, 55,504-8, 55,579.
Improved variety, production of, market would respond to, 55,510.
Local consumption, tendency to increase, 55,417.
Prices, comparison with price of wheat from other countries, 55,409.
Production, dates in various countries, 55,545-53.
Qualities required by millers, 55,484.
Varieties from other countries, tendency to revert, 55,509.
low Yield and comparison with other countries, 55,426-8, 55,495-7.

Rope and basket making, *see under* **Agricultural Industries.**

Rothamsted Experimental Station, evidence *re, see* **RUSSELL, Sir John,** (774-9), 58,389-58,596.

Rowett Research Institute, Aberdeen, organisation and scope of, &c., *Orr* (124-6), 53,169-246.

ROWLAND, G. E., Chairman of Agricultural and General Engineers, Ltd., &c., and **GOODWYN, J. A.,** of Messrs. Ransomes, Sims and Jefferies: (446-451), 56,131-56,319.

AGRICULTURAL ENGINEERS' ASSOCIATION, method of carrying on business in India, 56,134-8.

AGRICULTURAL AND GENERAL ENGINEERS LTD.:
Business in India, method of carrying on, (447).
Firms controlled by, (446-7).

AGRICULTURAL INDEBTEDNESS, lien on land should be prohibited, (450).

COTTON CULTIVATION, machine heavier and more powerful than standard tractor needed (451).

CULTIVATION, heavy power tillage, unsuitability of, for small holdings, 56,172-4.

EDUCATION, AGRICULTURAL:
Colleges, scope should be extended, (451).
Institutions, increase needed, (451), 56,205.
FINANCE, agricultural banks, proposal, (450).

HOLDINGS, SMALL, the great handicap to advancement of agriculture in India, 56,177, 56,205.

IMPLEMENTS:
Boilers, official representative should be appointed in England to approve designs and constants, (450), 56,235-6.
British manufacture:
Advantage over Indian manufacture in that no duty paid on implements but duty paid on raw material, 56,224-5.
Advantages of, and possibility and willingness as regards meeting requirements of cultivators, (448), (451), 56,147-53, 56,155, 56,284-5.

ROWLAND, G. E., and GOODWYN, J. A.—*contd.*

IMPLEMENTS—*contd.*

British manufacture—*contd.*

American and German competition, extent of, 56,307-10.
Business in Egypt, 56,279-81.
Competition, (449), 56,213-8, 56,287.
Co-operation of Agricultural Department, proposal for, (450), (451), 56,207-11, 56,297-306.
Copying by Agricultural Department of ploughs on which large sums spent on designs, and sale in competition with British made ploughs, (449), 56,234, 56,297-9.
Designs, constant changes of, by Directors of Agriculture, (448-449), 56,157-8, 56,183-6, 56,269.
Difficulties experienced by manufacturers, (448-9).
Distribution, problem of, (448), 56,208-9, 56,214, 56,277.
Export credit facilities, extension to India would assist, (451), 56,221-3.
Foreign competition in other countries, 56,317-9.
Market in India, question of prospects, 56,177, 56,181-2.
Method of carrying on business in India, and investigations carried out, (447), 56,134-8, 56,237-52, 56,256-67, 56,275.
Number of oxen required for different types published in catalogue, 56,175.
Placing of larger orders, prices could be reduced, (448), 56,149.
Ploughs, prices, 56,198.
Preference system, criticism of, (447-8), 56,219-20, 56,291-6.
Reduction of number of types, question, 56,155-60.
Reduction of railway rates in India would assist, 56,153.
Supply to Departments, handicap of terms of payment, (449).
Supply of parts and making up in India, 56,151-2.
Testing of power required, 56,176.
Types particularly suitable to India, 56,161, 56,284.

Central experimental station, objection to proposal, 56,270-75.
Cream separators, little scope for, 56,282-3.

Demonstrations:
at Government farms, &c., results disappointing, 56,252-3.
Scheme, (450).

Distribution through co-operative societies, obstacles in way of, 56,287-8.
Hire purchase system, difficulty of handling of, by manufacturers, must be dealt with by State, 56,142-5, 56,199-204.

Manufacture in India:
by British firms, questions in connection with, 56,165-70, 56,180.
by Kirloskar Brothers, ploughs, comparison with British, 56,178-80.

Oil engines, development of business in, by British makers, (450).

Ploughs:
All-steel, advantage of, but difficulties in way of introduction at present, 56,171, 56,174.
Iron, distribution by Departments of Agriculture, statistics, and inadequacy of, (449), 56,217.
Splitting of soil by country ploughs instead of inverting, and question of possibility of introducing deep ploughing or combination implement, 56,187-93, 56,311-6.
Total number in India, (449).

Popularisation of, demonstration the only means, 56,139.
Prime-movers for power water lifts, making of, by British manufacturers, 56,162-4.
Purchase on instalment plan, proposal, (450).
Purchase of, and placing at tenants' disposal by large landowners, proposal, (450), 56,206, 56,227-30.
Schools or depots in charge of native instructors in up-country towns, proposal, (450).

ROWLAND, G. E., and GOODWYN, J. A.—*contd.*

IMPLEMENTS—*contd.*
Spare parts, difficulties in way of stocking, (449).
Standardisation and mass production, difficulty, (448), 56,159-60, 56,232-3, 56,268, 56,290.
Types required in India very simple, 56,156.

IRRIGATION, development of major schemes by Government and of smaller installations by private owners, advocated, (451), 56,231.

TRANSPORT, improvement of, to main ports needed, (451).

Royal College of Veterinary Surgeons, *see under* **Veterinary.**

Rural Community Councils, England, *Nash* (605).

RUSSELL, Sir John, Director, Rothamsted Experimental Station: (774-779), 58,389-58,596.

AGRICULTURAL SERVICE, INDIAN, desirability of study leave at Rothamsted, 58,501-3.

DEVELOPMENT COMMISSION, approval of principle of, 58,447-8.

EDUCATION, scientific teaching in Universities, directions in which improvement desirable, 58,427.

PUSA RESEARCH INSTITUTE:
Direct contact with provincial workers, importance of, and question of method, 58,438-9, 58,467, 58,497-500, 58,526-9.
Staff, recruitment, desirable age, 58,470.
Suitability of, for dealing with problems of tropical India, question of, 58,436.

RESEARCH:
Agronomist, qualifications required, 58,417-8.
Association with teaching, opinion *re*, 58,406-9, 58,566-7.
Central stations, desirability of, factor of shortage of first-class workers, 58,441-3.
Duplication, advantage of, if not excessive, 58,396-7.
Elasticity, need for, and method of achieving, (775), (779), 58,514-6.
Financial problem, (779).
Organisation of, as aid to agriculture, (774-9).
Stations, direction and administration of, 58,429-30, 58,444-6, 58,589-96.
Team work, need for, (775), 58,535-6.
Workers:
Deterioration with age, tendency, (779), 58,472-3.
European, short-term engagements might be desirable for juniors, long-term necessary for seniors, 58,440, 58,482.
Qualifications required, (775).
Recruitment and training, 58,399-405, 58,428, 58,462-6, 58,504-7.
Supply, question of, 58,559, 58,604-5.

ROTHAMSTED EXPERIMENTAL STATION:
Administration, 58,431-2, 58,444-6, 58,519, 58,531-2.
Agricultural Education Association, relations with, and value of, 58,468-70.
Agronomist, duties of, 58,412-6.
Co-ordination and co-operation, measures for (776-7), 58,410, 58,483-4.
Effect on, of creation of Development Commission, 58,586-7.
Evaluation of results of work, measures for, (777-8), 58,419-22.
Experiments on commercial farms, 58,492-5.
Field work, 58,411-4, 58,419, 58,538-57.
Financing of, 58,530-4, 58,573-7, 58,587-8.
Functions and scope of, (776), 58,433-5, 58,477-8, 58,485-9, 58,561-5.

RUSSELL, Sir John—*contd.*

ROTHAMSTED EXPERIMENTAL STATION—*contd.*
Governing Body, 58,520, 58,571-2.
Indian students, qualifications, 58,423-6, 58,474-6, 58,583-5.
Planning and organisation of work, (776), 58,521-4, 58,537, 58,568-70.
Relations with commercial interests, 58,552-7.
Results of work, application of, (778-9), 58,490-1, 58,560.
Staff, (775), 58,411, 58,471.
Lectures to farmers, (776), 58,558, 58,578-82.
Lectures at Universities, 58,406, 58,409.
Recruitment procedure, 58,508-12.
Superannuation system, 58,517-8.
Staff Council, (777), 58,496, 58,525, 58,592-4.

SOIL SURVEYS:
Importance of, and type advocated, 58,391-3, 58,449-53, 58,620.
proposed Methods of carrying out, 58,454-61.
Staff required, 58,395.

SOILS, International Soils Congress, 58,621-5.

Rye, cultivation of, *Howard* 53,702-6.

Sericulture, *see under* **Agricultural Industries.**

SHEARER, E., Professor of Agriculture, Edinburgh University, and Principal, Edinburgh and East of Scotland College of Agriculture: (232-238), 54,005-54,270.
Indian and Egyptian experience, 54,006-8.
ADMINISTRATION, recruitment from Universities, etc., in Great Britain not likely unless appointments permanent, 54,194-8.
AGRICULTURAL DEPARTMENTS, training for, in Agricultural College in India and subsequently in England, proposal, 54,266-8.
ANIMAL HUSBANDRY, improvement of breeds by selection, scope for, (238).

CROPS:
Berseem, prospects in India, 54,201-4.
Improvement, scope for, and experience in Egypt and America, (238).
Protection, in Egypt, (238), 54,250-2.
Wheat:
Average yield in Egypt, 54,232.
Rust in, Egypt, 54,173-4.

CULTIVATION:
Egypt, farming under dry conditions, 54,042-5, 54,169-71.
by Large landowners, in Egypt, 54,121-5.

EDINBURGH UNIVERSITY:
Degree courses, 54,188-93.
Graduates from, as Deputy Directors for Indian Agricultural Service, suitability of, and question of subsequent training in India, 54,625, 54,269-70.
Indian students in, opinion *re* previous training, 54,145-52.
Recruitment from, for service in India, not considered possibility unless permanency guaranteed, 54,194-6.

EDUCATION:
Agricultural:
in America, (233), 54,136-8.
Colleges:
Course, requirements, (233-4).
Staff, improvement desirable and proposals for, (235-6).
Students, source of, (235).
in Egypt, (236), 54,139-44, 54,228-31, 54,255-9.

SHEARER, E.—*contd.*
EDUCATION—*contd.*
Agricultural—*contd.*
in England, (233).
General considerations, (232-6).
Nature study, value of, (234).
Universities, pure science teaching, opinion *re*, 54,148-52.
EGYPT:
Agricultural conditions, and comparison with India, (236), 54,031-45, 54,126-7, 54,156-63, 54,169-75, 54,200-1, 54,232-6.
Agricultural credit, conditions in, 54,009-30, 54,108-9, 54,176-80.
Agricultural Department, organisations and link with cultivators, 54,205-9, 54,245-9.
Animal husbandry, (238), 54,081-94.
Agricultural education, (236), 54,139-44, 54,228-31, 54,255-9.
Co-operative movement, no development, 54,107.
CROPS:
Improvement of, measures, (238).
Quarantine organisation, (238), 54,250-2.
Demonstration and propaganda, (237), 54,046-53.
Exports, 54,158-63.
Fertilisers, artificial, use of, (237).
Fruit trees, 54,238.
Higher education in, 54,222-4.
Holdings:
Fragmentation problem, 54,111-20.
One acre sufficient to support family, 54,033-40, 54,156-7, 54,232-6.
Implements, (238).
Irrigation in, (238), 54,054-67, 54,094, 54,164-6, 54,264.
Khedivial Agricultural Society, 54,208-9, 54,239-44.
Large landowners, farming by, 54,121-5.
Law of succession in, 54,110-1, 54,153-5.
Marketing, system of, 54,096-109.
Moneylenders, 54,010-2, 54,025-7.
Poultry keeping, 54,167-8.
Research in, (237), 54,218-27, 54,237, 54,261.
Soil:
Alkali, reclamation, (237), 54,054.
Deterioration from lack of drainage, (237), 54,263.
State Domains Administration, 54,261.
Veterinary, (238), 54,068-80, 54,214-7, 54,253-4.
Welfare of rural population, 54,128-33.
PUSA RESEARCH INSTITUTE:
Cattle farm, value as experimental station not considered very high, 54,186-7.
Situation, drawbacks of, 54,183-5.
SUKKUR BARRAGE, cotton cultivation, question of prospects, 54,210-3.
VETERINARY:
Civil Veterinary Department, desirability of control by Director of Agriculture, indicated by Egyptian experience, (238), 54,068.
Contagious diseases, legislation in Egypt, 54,214, 54,253-4.
Preventive inoculation, use of simultaneous method in Egypt, 54,076-80, 54,215-7.

Shellac, complaints by merchants in England of adulteration, *Lindsay* 53,820.

Shipping:
Deferred rebate system, *Demetriadi* 54,324-30; *Steiner* 54,511-4; *Swan* 54,907-13.
Freights, cultivators' prosperity not injured by, *Steiner* (281).

Siam, fertilisers, purchase system, *Speyer* (484).

Silk, work by Imperial Institute, *Furse* (506), 56,474, 56,494.

Soils:

ALKALI:
Formation of, as result of irrigation and need for research work, *Howard* (177), (179-80).
Improvement by use of calcium cyanamide, possibility, *Greening* (748).
Reclamation:
in Egypt, *Shearer* (237), 54,054.
Method of, *Pelly* (625), 57,379.
Research by Provinces advocated, *Gebbie, Ward,* 56,879-82.
Cultivable land gone out of cultivation, reclamation measures, *Pelly* (626).
Hardened subsoil, methods of improving, *Pelly* (625-6).
Hariali, Kunda or *Kans* grass, means of eradicating, *Pelly* (625), 57,387-94, 57,408-14.
Improvement, proposed measures for, *Fagan* (57); *Pelly* (624-5), 57,416.
International Soils Congress, *Russell* 58,621-5.

SURVEYS:
Importance of, and type advocated, *Russell* 58,391-3, 58,449-53; 58,620.
proposed Methods of carrying out, *Russell* 58,454-61.
Staff required, *Russell* 58,395.
Uncultivable land, proposed methods of reclamation and improvement, *Pelly* (625), 57,342-9.
Virgin land, proposed methods of preparing, *Pelly* (625), 57,417-20.
Waterlogging, research by Provinces advocated, *Gebbie, Ward,* 56,879-82.

SPEYER, F. C. O., General Manager, Nitram, Limited, and British Sulphate of Ammonia Federation, Limited: (471-488), 56,320-56,473.
AGRICULTURAL INDEBTEDNESS, *Sowcars,* rates of interest charged, (482).
BRITISH SULPHATE OF AMMONIA FEDERATION:
Enlargement of organisation, (480-1).
Organisation, (480).

CHINA:
British Sulphate of Ammonia Federation work in, 56,369-75.
Night soil, use of, and effect of use of sulphate of ammonia, 56,398-9.

CO-OPERATIVE BANKS, rates of interest charged, (482).

COTTON, sulphate of ammonia, probable large consumption and supply of mixed manures proposed, 56,448-9.

FERTILISERS:
Artificial:
Adulteration, prevention, proposed means, (484), 56,407. 56,460.
Agricultural Departments' financial resources should be increased for carrying out experimental and demonstration work, (471), (478).
Bagging system, 56,358-61, 56,436-9.
Central Bureau of Information, opinion *re* Mr. Hutchinson's proposal, 56,365-6.
Central Fertiliser Office, scheme for, (474-5), 57,334-50, 56,365-8, 56,432-5, 56,440-6.
Collaboration between agricultural departments and industry advocated, and proposed method, (472), (473).
Cost of transport and distribution and handicap of, and proposal, (482), 56,400-1, 56,464-7.
increased Demand anticipated in time, (472).
Demonstrations needed on large scale, (471), (478).
Economic factor, (472), 56,461-2.
Economic use of, need for further research and extent to which experience in other countries applicable, 56,356-7, 56,362-4.

SPEYER, F. C. O.—*contd.*
FERTILISERS—*contd.*
Artificial—*contd.*
Evidence of Mr. Hutchinson and Mr. Maurer agreed with, 56,322.
Fertiliser Propaganda Company of India, Ltd., formation of, (481).
Functions of, (477).
Mixed manures, proposal, 56,449-55.
Nitrogen:
Breeding of new types of plants more capable of responding to, possibility of, and need for research, (484).
Economic results in Germany, (482).
Future prospects, (480), 56,396, 56,410-4.
Importance of, (478).
Increased use of, (480).
Production from the air:
Erection of works would be considered by Imperial Chemical Industries if considered advisable, (476).
Possibility investigated but not considered economic under present conditions, (476), 56,351-4, 56,397, 56,410.
Use of, extent, (479).
Price factor, (481-2).
Retail selling organisations, (473-4), (481), 56,232-33, 56,378.
Sale:
through Co-operative societies, 56,387-9.
more Successful in irrigated areas, 56,394-5.
Systems of:
Credit, proposed system, with Government assistance, (482-4), 56,424-31.
in Egypt, (483), (486), (487-8), 56,403-6, 56,425-7.
Payment when payment received for crops, (482).
in Siam, (484).
Scientific experiments, need for, (477).
Sulphate of ammonia:
Addition to night soil, killing of hookworm by, 56,399.
Consumption in Java and Spain, 56,468, 56,469-70.
former Export to Java, (480).
Export and import and consumption, 56,471-3.
Holding of stocks, 56,456-7.
Indian production, 56,390-1.
Results obtained in Great Britain and Ireland on various crops, (485).
Tata's factory, export from, 56,421-3.
increased Use of, (480).
Use of, in India, and prospects, 56,392-5, 56,447-8, 56,458-9.
Use of, in India, (472), (479-80).
Use of natural fertilisers complementary to, 56,339-40.
adequate Water supply essential to successful use of, (484).
increased Demand for, (471).
Economic importance of, (478-9).
Research:
Increase needed, (471).
Scheme for, (475), 56,343-50, 56,367-77, 56,433-5, 56,443-6.
IMPERIAL CHEMICAL INDUSTRIES, contribution offered towards propaganda and research work in India, (475-6), 56,346-50, 56,408-9.
NITRAM, LIMITED:
Agricultural Research and Advisory Department, staff, (476), 56,379-86, 56,417-9.
Attitude of agricultural departments, 56,355.
Formation, (481).

SPEYER, F. C. O.—*contd.*

NITRAM, LIMITED—*contd.*
Indian staff, (473), 56,379-83, 56,415-8.
Methods of carrying on business, (472-3), 56,328-33.
Propaganda and research work by, and results, (472-3), 56,344-6, 56,419-26.

SUGAR:
Acreage and production and comparison with Java, (470).
Imports, (480).

Spice and ginger, etc., quality satisfactory but increased production desirable, *Steiner* 54,545-7.

Statistics:

AVERAGE YIELDS:
Payment of fee to cultivators on whose fields subjects are investigated, proposal, *Fagan* (64), 52,546.
Scientific procedure needed and proposal, *Fagan* (64), 52,763-9.

CROP FORECASTS:
Accuracy, extent of, *Fagan* (64).
Distinction should be made between quantities available for export and quantities used for home consumption, *Steiner* 54,548-9, 54,581-5, 54,596-608.
Cottonseed, in Egypt, *Frost*, 54,691.
Jute, *see that title.*
Period at which required by exporters, *Demetriadi* 54,372-6
Value of, to exporters and earlier publication desirable, *Pfister* 54,367-72.
Crop reports, American system, *Foley* 58,161-7, 58,195-7.
England, work of Ministry of Agriculture and Fisheries, *Floud* (2), 52,151-6.
Expert agency for scientific treatment of, need for and proposal, *Fagan* (46-7), (64), 52,675, 52,706-7.
Improvement, possibility of, *Fagan* (46-7).
Land Records, opinion *re*, *Fagan* 52,704-5.
Resources, *Fagan* (46).
Statistical assistant attached to staff of Director of Agriculture would be an advantage, *Grantham* 57,126-8.

Steel Brothers and Co., Messrs., evidence on behalf of, *see* **SWAN, J.**, (320-321), 54,854-55,054.

STEINER, E., representing Messrs. Volkart Bros.: (280-1), 54,476-54,653, (294-5).
COPRA, import duty on copra from Ceylon and effect on export of copra from Malabar, 54,536-41, 54,594-5.

EMPIRE MARKETING BOARD, advertising of Indian products not considered necessary, 54,636-40.

GROUNDNUTS:
Admixture of dirt, 54,554-6.
Basis of sale in England, 54,609-13.
Best quality believed to be consumed locally, not exported, 54,553.
Damping of:
Government enquiry, 54,477-8.
Results, 54,477.
Deterioration if supply of good seed not maintained, 54,477.

Export:
Distribution of, 54,558-61.
Packing, no improvement in method needed, 54,628.
Position in London market, and scope for increased supply, 54,484-503.

STEINER, E.—*contd.*

GROUNDNUTS—*contd.*
Export—*contd.*
Price, factors affecting, 54,554, 54,578, 54,615.
Prices on London market compared with Chinese and Nigerian, 54,620-5.
Extension advocated, 54,477, 54,557.
Extension of cultivation in some districts, 54,557.
High oil content, better price would be given for, 54,615-6.
Improvement of quality, 54,503, 54,550-2, 54,565.
Production increasing, but supply for export stationary, 54,617-9.
Research *re*, advocated, 54,478.
Seeds, supply of good seed to cultivators not the business of merchants, 54,566.
Shelling, importance of leaving skin intact to prevent nuts turning rancid on voyage, 54,579.
Unshelled, no trade for, 54,645-7.
Weevil, nuts kept in shell until shipment as protection, 54,567.

IMPLEMENTS:
Agency business for International Harvester Company and Messrs. Wallace Brothers, 54,589-92, 54,648-53.
Hire-purchase system, price would be increased unless carried out by co-operative societies, 54,564.

IMPORT into India of vegetable *ghi* from Holland, 54,571.

MARKETING:
Buying agencies, direct purchase from cultivators, advantage, 54,516-8, 54,521
Facilities satisfactory, (280), 54,520-2.
Financing of transactions, (280)
Forward contracts, difficulties experienced, 54,521, 54,572-3.
Information to cultivators, etc., as to market conditions, etc., service satisfactory, (281), 54,635.
adequate Premium for quality received by cultivators, selling direct, 54,523-9.
Spice and ginger, etc., quality satisfactory but increased production desirable, 54,545-7.
System of, through *sowcars* and *artiyas*, (280), 54,525-8, 54,580.

OILSEEDS.
Castorseed, exports during 1926 and details, (294).
Cottonseed, demand, (294-5).
Gingellyseed or tilseed, decreasing export, but local demand increasing, (295).
Linseed:
Falling off in export, (294).
Qualities of, (294).

SEA FREIGHTS:
Cultivators' prosperity not injured by, (281-8).
Deferred rebate system, results, 54,511-4.

STATISTICS, crop forecasts, distinction should be made between quantities available for export and quantities used for home consumption, 54,548-9, 54,581-5, 54,596-608.

SUGAR, import, not affected by duty, 54,575-7

TARIFFS:
Cultivators' prosperity not injured by, (281).
Export duty on hides, abolition desired, 54,593.

VOLKART BROTHERS:
Business of, 54,480-4, 54,504-11, 54,542-5, 54,562-3, 54.642-4
Information *re* trade, sources of, 54,529-35.
Method of doing business and question of effect of extension of co-operative movement, 54,586, 54,629-34, 54,641.

Sugar, Colonial Exports, *Ormsby Gore* (435), (436).

Sugar industry:

in Denmark, *Faber* 52,939-45.
Development of, memorandum, *Barber* (751-7).
Employment of Indian capital and Indian officials, scope for, *Barber* 58,338-9.
Importance of, *Barber* 58,330-1.

IMPORTS: *Speyer* (480); *Barber* 58,337.
not Affected by duty, *Steiner* 54,575-7.
Duty, specific duty, benefit to industry, *Chadwick* 55,840-1, 55,845.
Question of effect, *Chadwick* 55,843.
Improvements in preparation of raw juice necessary, *Barber* (755).

PROTECTION:
no Application made for duty, *Chadwick* 55,836-7, 55,840-1.
Justification for, *Barber* 58,340-1, 58,374-6.
in Other countries, *Barber* 58,340-1.
Sugar Bureau, work of, and scheme for development, *Barber* (752), 58,288-303.
White sugar production, India should be self-supporting, *Barber* 58,337.

Sugarcane:

Acreage and production and comparison with Java, *Speyer* (480).
Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).

COIMBATORE CANE BREEDING STATION, evidence *re*, *see* **BARBER, Dr. C. A.**

CULTIVATION:
Encouragement desirable, if good cultivation, *Keatinge*, 57,027-30.
Improved methods important but success of improved cane even where no change in method of, *Barber* 58,363-7.
Damage by wild pigs in canal tracts of the Deccan, *Keatinge* (570).
Degeneration and deterioration and causes, *Barber* 58,345-50.
accurate Descriptions of all canes in India, need for, and proposal, *Barber* (756-7).
Diseases, *Barber* 58,349.
Method of dealing with, *Howard* (181-2)

IMPROVED VARIETIES:
Propaganda:
Example of success, *Barber* (753).
Recommendation *re*, *Barber* (754).
Success of, even where no change in cultivation, *Barber* 58,360-7.
Improvement, importance of, *Barber* 58,332.
Indigenous canes, importance of study and improvement, *Barber* (755).
Poona cane, opinion *re*, *Barber* 58,287.
Production, increase when price of *gur* increased, and price of *gur* affected by imports of refined sugar, *Keatinge* 57,021-7.
Propaganda, methods, and example of success, *Barber* 58,328-9.

RESEARCH:
Central Institution with number of sub-stations, scheme for, *Barber* (753), 58,310-24, 58,377-8.
Scheme, *Barber* (753), (755-7).

SEEDLINGS:
Java method of short planting for rapid multiplication of seed, difficulties in way of introduction in India, *Barber* 58,325-6.
One-bud system of planting, no advantage, *Barber* 58,327.
Species of canes and origins, *Barber* 58,342-7.
Sulphate of ammonia, use of, *Speyer* 56,394, 56,448.
Tropical canes, acclimatisation, study of problem advocated, *Barber* (756).

Sukkur Barrage, *see under* **Irrigation.**

SWAN, J., of Messrs. Steel Brothers and Co., Ltd.: (320-321), 54,854-55,054.

BEANS, BURMA:
Market for, 55,040.
Prussic acid in, reputation, 55,039-43.

COTTON, Burma, increased production desired, 54,916.

GROUNDNUTS, Burma, export of cakes, 5,914-5.

RICE:
Burmese:
Beelugyum paddy, 54,926.
Demontsration farms, proposal, 54,871-2, 54,884, 54,928-34, 55,036-8.
Export trade:
Appearance of grain, importance of, in London Market, 54,935-41, 54,957-69.
Bulk shipping not suitable for, 54,892-3, 55,009-11.
Duty, 54,904-5, 54,949-50.
to Europe, distribution, 54-894-5.
London market, contract system, 54,885-7.
Percentage ot unhusked grain left in, 54,998-9.
Proportion, 54,986.
Quality demanded, 54,991-3.
Shipping facilities, 54,906-7, 54,912-3.
Spanish rice, increased demand for, in England, 55,019-22.
to United Kingdom, decreased demand for, and reasons (321), 54,863-8.
Units of shipment, 54,951-3.
Hand hullers, little scope for, 55,027-31.
Improvement:
Scope for, 55,034-5.
by Selection of grain and improved methods of cultivation advocated, (320).
Varieties distributed by Agricultural Department and premiums given on, 54,919-21, 54,860, 54,984-5.
Inferior, export to India, 54,982.
Japan type, suitability, 54,927.
Marketing:
Facilities satisfactory, (321).
Internal organisation of, 54,881.
Premium paid for quality, but not necessarily received by cultivators, 54,882-4.
Units of measurement, 54,879-80.
Organisation on lines of Indian Central Cotton Committee, carrying out of work by Government would be preferred, 54,873-7.
Prices, 54,973-6, 54,989-90.
Quality, inferiority of, to rice from other countries, and need for improvement, (320), (321), 54,860-2, 54,866-8.
Red grain, elimination question, 54,868, 54,922-4.
Reputation in European markets, lowness of, 54,859-62.
Research necessary, 54,970-2.
Rice bran, import into England, 54,896-9.
Selection of seed grain, importance of, and proposals, (320), 54,854-7, 54,871, 54,928-34.
Specifications could be given to breeders attempting to meet various European demands, 55,013-8.
Sughundi grain, 54,860, 54,925.
Varieties, 54,988.
Germ question, 55,023-6.
Grinding of, 54,901-2.
Improvement, scope for Agricultural Department, 54,983, 55,034-5.

SWAN, J.—*contd.*

RICE—*contd.*
Improvement of methods of cultivation desirable, (321).
Japanese importation, effect on market, 54,942-6.
Milling, effect of, 55,044-5.
Movements of, 54,978-81.
Patna, export, development possibility, 54,947-8, 54,963.
Pearling of, and effect of, 55,000-7, 55,044-5.
Polishing of, effect, 55,033.
World demand, prospects, 54,869-70.
Yield, question, 54,994-6.

SHIPPING, deferred rebate system, 54,907-13.

STEEL BROTHERS AND CO., MESSRS., nature of business, 54,888-91, 54,908, 54,914.

Tanning materials, work by Imperial Institute, *Furse* (506), 56,474.

Taccavi loans, *see under* **Finance.**

Tariffs:
Cultivators' prosperity not injured by, *Steiner* (281).
Export duty on hides, abolition desired, *Steiner* 54,593.
Import duty on sugar, *see under* **Sugar industry.**

TAYLOR, C. H., Wheat Department, Messrs. Ralli Bros.: 54,271-54,475.

BARLEY, export, possibilities of development, 54,438.

WHEAT:
Earlier maturing variety desirable, 54,475.
Elevators, little advantage seen, 54,470.
Export:
Creation of new markets for, question of, 54,299.
Deterioration of quality from some districts, 54,355, 54,421-4.
Grading system, 54,289-90.
Higher quality, quantity required to secure premium, 54,387-9.
Karachi Fair Average Quality the only standard which counts, 54,315.
Karachi, attempt to improve quality but non-success as quantity not worth while, 54,291-2, 54,355.
Punjab, quality of, 54,433-5.

Tea:
Advertising campaign, *Ormsby Gore* 56,011, 56,012.
Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
Capital, Indian, *Carmichael* 55,611-5.

CESS:
Committee:
Constitution, *Carmichael* 55,700, 55,714-6.
Operations in U.S.A. and France, *Carmichael, McLeod* (388-91), 55,586-9, 55,698-9.
Money devoted to propaganda work, *Carmichael* 55,701, 55,712-31.
Price not affected by, *Carmichael* 55,709.
Revenue from, *Carmichael* 55,710-1.
Ceylon Association, *Carmichael* 55,657-9.
Coffee competition, question of, *Carmichael, McLeod* 55,687-9.
Colonial exports, *Ormsby Gore* (436).
Comparison with Ceylon tea as regards quality and price, *McLeod* 55,667-70.
Competition of other countries, *McLeod, Carmichael* 55,645-6, 55,663-6, 55,681-6, 55,706-8, 55,722-3, 55,726-31.

ESTATES:
of Co-operative Wholesale Society, *Carmichael, McLeod* 55,733-4.

Tea—*contd.*

ESTATES—*contd.*

Labour:

Position *re*, and removal of restrictions on recruitment desired, *Carmichael* 55,599-610, 55,616-31, 55,702-5, 55,719-21; *McLeod* 55,620, 55,651, 55,671-6.

Restrictions on recruitment, *Chadwick* 55,835, 56,840, 55,842.

Welfare and education work, *Carmichael* 55,717-8.

EXPORT TRADE:

Increase in fifty years, and future prospects, *Carmichael*, *McLeod* 55,635-9.

Mark of origin on packets of tea, proposal, *Carmichael* 55,596-8.

Position in different markets, *McLeod*, *Carmichael* 55,645-9, 55,651, 55,663-6, 55,690-7, 55,735-8.

Position as regards world trade, *Carmichael* 55,583.

Statistics, *Carmichael*, *McLeod* (389-391), 55,660-2.

FERTILISERS:

Means of obtaining, *Carmichael*, *McLeod* 55,643-4.

Nitrogen, extent of use of, *Speyer* (479).

one Organisation would be advantageous, *Ormsby Gore* 56,012-3.

One organisation for the British Empire, desired, *McLeod*, *Carmichael* 55,724-5.

Organisation of trade, *Carmichael* 55,585.

QUALITY:

Improvement in, *Lindsay* (213).

Policy of Indian Tea Association, *McLeod* 55,677-80, 55,682-3.

Southern India industry, relations with Indian Tea Association and question of combined Association, *Carmichael* 55,652-6.

Timbers, work carried out by Imperial Institute, *Furse* (506), 56,474, 56,494.

Tobacco:

Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).

Burma Cheroots, import into United Kingdom, *Jarrett* 56,744-55.

Canada, cultivation and market, *Wilson* 56,662-6.

Cigarette tobacco, Indian, not to European taste, *Jarrett* 56,741-2.

CIGARS:

Advertising question, *Jarrett* 56,756.

Imports into United Kingdom:

Effect of duty on, and question of increasing trade, *Lindsay* 53,954-71.

Export to Europe not allowed, *Jarrett* 56,743.

Exporting firms, *Jarrett* 56,738-70.

Importing firms, *Jarrett* 56,727-9, 56,774-5.

Mixing of Indian and foreign tobacco in, *Jarrett* (544), 56,678-82, 56,698-701, 56,722.

Pushing of trade, steps taken, *Jarrett* 56,777.

Quality, deterioration, *Jarrett* (543), 56,674-9.

practically Stationary since about 1923, *Jarrett* 56,730.

Statistics, and decline in, *Jarrett* (543-4), 56,673, 56,682-9, 56,702-15, 56,778-88.

Markets in other parts of the world, *Jarrett* 56,723-6.

Commercial prospects, *Howard* 53,699-702.

Competition of other countries, *Jarrett* 56,771-2.

Complaints by merchants in England, *Lindsay* 53,817, 53,824.

IMPORT DUTIES INTO UNITED KINGDOM:

Change from weight to *ad valorem* basis, question of probable effect, *Jarrett* 56,691-6, 56,716-20.

Rates of, and effect, *Jarrett* (543), (544), 56,674, 56,682-3, 56,686-90, 56,703-15, 56,731-7, 56,781-8.

Steps taken, but without results, *Jarrett* 56,778-80.

Tobacco—*contd.*
Organisation on lines of Central Cotton Committee not considered suitable, *Howard* 53,697-8.
East African exports, *Ormsby-Gore* (435).
Raw, imports into United Kingdom, *Jarrett* 56,760-9.
RESEARCH:
Financing of, by cess, proposal, *Lindsay* (806-7).
Needed, *Butler* 53,336.

Trade of India:
Domestic, importance of, *Chadwick* (402), 55,787, 55,802-9, 55,814-21.
EXPORT:
Falling off in, would have bad effect on producers, *Chadwick* 55,871-3.
Rupee at 1s. 4d. would have assisted, *Demetriadi* 54,339.
FOREIGN:
Future prospects, *Chadwick* (401), 55,754.
Statistics, and comparison with Crown Colonies and Mandated Territories, *Chadwick* (401), 55,755-6, 55,783-6, 55,857.
IMPORT:
Development, *Chadwick* 55,790.
Extent of interest of Indian agriculturists in, Director of Statistics could probably work out, *Lindsay* 53,895-7.
Section to which trade goes, &c., question of machinery for watching, *Lindsay* 53,900-5, 53,907-11.
Treasure, *Chadwick* 55,790-2.

Trade Commissioners:
in America, not proposed, *Chadwick* 55,747, 55,749.
in East Africa, at one time, but no scope for, permanently, *Chadwick* 55,868.
in Germany, proposal, *Chadwick* (404), 55,747.
IN LONDON:
Advisory Committee:
not Advocated, *Lindsay* 53,804-6; *Demetriadi* 54,323.
not Necessary, *Chadwick* 55,744-6.
Duties, work of, and office organisation, *Lindsay* (208), 53,778-808, 53,931-4.
Functions, *Chadwick* 55,750, 55,810-1.
Information sent out to India by, question as to following up of, *Lindsay* 53,870-4.
Office:
Accommodation in India House proposed, *Chadwick* (403-4), 55,751-3.
in the City, desirability of, *Demetriadi* 54,321-2.
Removal to Grosvenor Gardens, work handicapped by, *Lindsay* 53,983-6; *Chadwick* (403).
Officials and institutions corresponded with, in India, *Lindsay* 53,867-9.
Relations with High Commissioner, *Chadwick* (403-4), 55,752-3.
Staff, proposed increase, *Chadwick* (403-4), 55,748.
Valuable work done by, *Demetriadi* 54,321.
Value of, to large firms, *Chadwick* 55,746, 55,812.
IN OTHER COUNTRIES:
Advocated in future, after training in London, *Chadwick* (404), 55,747-8.
Deputations or visits from the trade preferable as regards certain countries, *Chadwick* 55,868.
Desirable, *Lindsay* 53,788-90, 53,826-7.
in Southern France and Northern Italy, proposal, *Chadwick* (404), 55,747.

Trinidad, Imperial College of Tropical Agriculture, *Ormsby-Gore* 55,880, 55,947-50, 55,982-90, 56,008.

United States of America, *see* **Foley, Edward A., Ph.D.,** 58,067-58,244 (746), (814-815).

Vegetable Culture, *see* Fruit and vegetables, *under* **Agricultural industries.**

Vegetable *ghi, &c.*:
Certificate of chemical analysis, copy attached, *Pfister* 54,405-6.
Containing animal fat, guarantee against, and no inducement, *Knight* 56,099, 56,122-5.
Import, and question of margarine manufacture in India, *Lindsay* 53,935-9, 53,946-9.
Industry, *Knight* 56,119-21.
Manufacture in, and export from, Holland, *Steiner* 54,571; *Knight* 56,092-8.

Veterinary:
Assistants, need for increased number formerly, *Fagan* 52,628-31.
Civil Veterinary Department:
Combination with Agricultural Department desirable, *Keatinge* 56,955-7.
Control of cattle-breeding by, question of, *Fagan* 52,699-701; *MacFadyean* 52,418-20.
Control by Director of Agriculture:
not Advisable, *MacFadyean* (28), 52,384-6.
Approved as regards questions of policy, *Fagan* (58), 52,698.
Desirability of, indicated by Egyptian experience, *Shearer* (238), 54,068.
Control by Director-General with Government of India advocated, and reasons, *Gaiger* (717), 57,971-3.
should be Independent, *Buxton* (710), 57,835.
Colonies, problem and present position *re*, *Ormsby-Gore* 55,881-93, 55,910, 55,978-81.
Contagious Diseases:
American system of dealing with, *Buxton* 57,838-41, 57,867-70, 57,880-1; *Foley* 58,155, 58,169-70, 58,205-7.
Central control of administration necessary, *MacFadyean* 52,388-91.
Centralisation of control advocated, *Gaiger* (717-8), 57,917-9, 57,974-82, 58,018-28.
Control:
in Australia, *Julius* 57,539-40.
Canadian system, *Wilson* (529), 56-619-22.
Controlling staff, question of, *Gaiger* 58,019-21, 58,038-41, 58,044.
Legislation:
Advocated, *Buxton* (710), 57,836-41, 57,877.
in Egypt, *Shearer* 54,214, 54,253-4.
Experiment advocated, *Fagan* (58).
Obstacles in way of dealing with, *Fagan* (58).
Development, importance of, for improvement of agriculture, *Fagan* (46).
Director-General, appointment scheme, *Gaiger* (718), 57,917-9, 57,974-82.
Dispensaries, control by District Boards, and control of contagious diseases by Department, proposal approved, *Gaiger* 58,042.
England: *Floud* 52,246-9.
Diseases of Animals Acts, administration, and operation, *Floud* (4-6), 52,202, 52,242-5, 52,329-32; *MacFadyean* (26-7), 52,382-3.
Organisation of service, *MacFadyean* (25-7), (27-8).
Research staff, prohibition from teaching and drawback of, *MacFadyean* 52,448, 52,449, 52,502, 52,518-9.

Veterinary—*contd.*
ENGLAND—*contd.*
Veterinary surgeons from other countries practising in England not allowed to use title without diploma of Royal College of Veterinary Surgeons, *MacFadyean* 52,509-12.
Work of Ministry of Agriculture and Fisheries, *Floud* (2), 52,162-3, 52,189, 52,259, 52,277, 52,324-32.
Indian qualification, not likely to rank with European diplomas, *MacFadyean* 52,433-7.
Indian students, opinion *re*, and need for training in England, *Gaiger* 57,926-31.
PREVENTIVE INOCULATION:
Obstacles in way of, *Fagan* (58).
no Prejudice against, now, in Colonies, *Ormsby Gore* 55,893.
Serum-alone method *v.* simultaneous method, *MacFadyean* 52,409-10.
Simultaneous method:
Disadvantage of, but possibility of avoiding, *MacFadyean* 52,412-7.
Use of, in Colonies and results, *Ormsby Gore* 55,882-90, 55,971-2.
Use of, in Egypt, *Shearer* 54,076-80, 54,215-7.
Value compared with serum-alone method, *Buxton* 57,843-9, 57,871-6; *Gaiger* 57,912-6, 57,955-70.
RESEARCH:
Central and subsidiary stations advocated, *Buxton* 57,859, 57,864-6, 57,884-7.
Concentration in one institute preferable at present to setting up several, *MacFadyean* 52,506-8, 52,516-8.
in England, *MacFadyean* (27-28), 52,404-8, 52,447-51, 52,514.
further Facilities advocated, *Buxton* (710).
Muktesar Institute, *see that title.*
Need for, *Fagan* (42), (43).
in Veterinary schools in provinces, scheme for, *Gaiger* (718), 57,920-5, 57,983-91, 57,999-8017, 58,045-56.
Workers:
Qualifications required, *MacFadyean* 52,456, 52,515.
Recruitment, proposal, *Buxton* 57,903-8, 58,047-51.
RINDERPEST:
Barrier method of dealing with, in S. Africa, *Gaiger* 57,913.
Dealing with, would be more difficult in India than in Kenya, Nigeria, etc., *Ormsby Gore* 55,954-6.
Immunising campaign, desirability etc., *Gaiger* 58,029-31.
Research *re*, proposal, *Buxton* 57,876.
anti-Rinderpest serum, manufacture of, in African Colonies, *Ormsby Gore* 55,885, 55,886, 55,965-70, 55,974.
ROYAL COLLEGE OF VETERINARY SURGEONS:
Conducting of examination in India by, impossibility, *MacFadyean* 52,463-4.
Diploma, extent to which recognised in other countries, *MacFadyean* 52,465-74.
Diploma in Veterinary State Medicine, curriculum, *MacFadyean* 52,400-3.
Functions, *MacFadyean* (26), 52,489-90.
Object of, and question of application of system to India, *MacFadyean* 52,443-6.
Recognition of Indian degree, question, possibility of, *MacFadyean* 52,394-5, 52,462.
Royal Veterinary College, London, quality of Indian students, *MacFadyean* 52,396-9, 52,438-40.
SERUM:
Distribution system in England, *Buxton* 57,893-7.
Storage at number of centres, adequate facilities advocated, *Buxton* (710), 57,842, 57,878-9.

Veterinary—*contd.*

Service, proposed organisation of, *MacFadyean* 52,476-9.
Superior Veterinary officer with Government of India, appointment advocated and proposed functions, *Buxton* (710), 57,862-3.
Surra, question of cure, *MacFadyean* 52,504-5.

TRAINING:
in Australia, *MacFadyean* 52,491-9.
in England:
Colleges, affiliation of Indian Colleges to Royal College of Veterinary Surgeons would not be possible, *MacFadyean* 52,430-1.
few Students from Colonies and Dominions, *MacFadyean* 52,491.
System, *MacFadyean* (25-27), 52,400-3, 52,441-55, 52,489-91, 52,513.
in Tropical diseases, extent of, *MacFadyean* 52,502-3.
Four-year course after two years' general science course, opinion *re* proposal, *MacFadyean* 52,480-5.
Institutions, carrying on of research work in, not advocated, *MacFadyean* 52,516-8.
Opinion *re*, and question of requirements, *Gaiger* 57,932-54, 58,032-7.
Requirements and qualifications, opinion *re*, *MacFadyean* 52,480-8.
Subsequent training in England desirable, *MacFadyean* 52,432-3, 52,437.
Veterinary Adviser with Government of India, appointment would be approved if suitable man were available, *MacFadyean* 52,457-61.

Village Industries, position of, and question of action *re*, *Chadwick* 55,822-32.

Volkart Brothers:

Business of, *Steiner* 54,480-4, 54,504-11, 54,542-5, 54,562-3, 54,642-4.
Evidence on behalf of, *see* **STEINER, E.**, (280-1), 54,476-54, 653, (294-5).
Information *re* trade, sources of, *Steiner* 54,529-35.
Method of doing business and question of effect of extension of co-operative movement, *Steiner* 54,586, 54,629-34, 54,641.

WALKER, Sir Gilbert, C.S.I., M.A., Sc.D., F.R.S., Professor of Meteorology, Imperial College of Science and Technology: (201-2), 53,707-53,774.

FORESTS, rainfall not decreased by deforestation, but soil-erosion caused, (201).

JUTE, correlation of rainfall and outturn, question of possibility, 53,756-9.

METEOROLOGY:
Correlations between rainfall, area and outturn, work *re*, and extent of value of, 53,752-9.
Cycles, no value attached to, 53,771.
Department:
Co-operation between Irrigation Department and, desirability of, and means, 53,741-8.
Functions in connection with agriculture, (201-2).
Staff, adequacy of, for provision of ordinary statistical and meteorological data, 53,709-13.
Value of, to agriculture, (201).
Droughts during last 25 years, 53,767-9.
German and Dutch information available to Government of India, 53,720.
Mr. Hooker's work on English crops, (201-2), 53,762-5.

WALKER, Sir Gilbert—*contd.*

METEOROLOGY—*contd.*
Inadequacy of data of crops available for correlation with meteorological factors, (202), 53,724-5.
Jacob's method of working out correlation coefficients, 53,722-3.
Long-range forecasts:
Extent of value of, and further work required, 53,714-7, 53,749-51, 53,760-1, 53,767, 53,770.
of Floods from melting of snows, not possible at present, 53,726-40.
Nile conditions and Indian monsoon conditions, connection, 53,772-4.
Upper air conditions, value of measurements of, for weather forecasts, 53,717-9.

WARD, Sir Thomas, Kt., C.I.E., M.V.O., *see* **GEBBIE, Sir Frederick, Kt., C.I.E., and WARD, Sir Thomas, Kt., C.I.E., M.V.O.,** (554-555), 56,789-56,925.

Weaving, *see under* **Agricultural Industries.**

Welfare of Rural Population:
Agencies for improvement of, question of, *Fagan* 52,717-21.
ECONOMIC SURVEYS:
on Large scale preferable, *Keatinge* 57,057-8.
by Madras University students, collection of information through University organisation preferable to collection by Government, *Macphail* 57,591-3.
by Non-officials desirable, and proposals *re*, *Fagan* (63-4), 52,542-5.
Useful if on right lines and proposals *re*, *Fagan* (63), 52,542-5.
in Egypt and comparison of conditions with India, *Shearer* 54,128-33.
Horace Plunkett Foundation in London, work of, *Adams* 53,532.
Improvement in material prosperity of Deccan villagers, *Keatinge* 56,965-7.
Means of improving, *Keatinge* 56,968-70.
National Council of Social Service, England, *Adams* 53,492-502.
Rural Community Council movement in England, and work in villages, *Adams* 53,492-502, 53,512-31, 53,542-3.

Wells, *see under* **Irrigation.**

Wheat:
Advantage of, for mixing purposes, *Demetriadi* 54,295-7.
Area under, 1903-4, 1913-14, 1923-24, *Lindsay* (805).
AUSTRALIAN:
Freight to London and to India, *Robson* 55,431-4.
Import into India, *Robson* 55,417-21, 55,504-8, 55,579.
Blending of, in milling, *Robson* 55,410-12, 55,429-30, 55,483, 55,516.
BULK STORAGE AND HANDLING:
Attitude of Messrs. Ralli Bros., *Demetriadi* 54,313-4; *Pfister* 54,314.
no Difficulty anticipated as regards construction of steamers, *Willson* 54,312; *Demetriadi* 54,312.
no Suggestion by trade in England, *Lindsay* 54,875.
no Complaints from merchants in England, purity believed to be satisfactory, *Lindsay* 53,851-6.
Earlier maturing variety:
Desirable, *Pfister* 54,475; *Taylor* 54,475.
would be a Short-sighted policy, *Robson* 55,543-4.
Elevator system and bulk storage probably too costly for internal trade, *Pfister* 54,311.
ELEVATORS:
little Advantage seen, *Taylor, Demetriadi, Pfister* 54,470-75.

Wheat—*contd.*

ELEVATORS—*contd.*
American system, *Foley* 58,095-6.
not considered Desirable in view of state of export trade, *Robson* 55,440-3, 55,448.
Number of grades required, *Pfister* 54,386.
at Ports and not up-country, not advocated, *Pfister* 54,306-8, 54,555-7.
English, comparison with Canadian, *Robson* 55,498-503.

EXPORT TRADE:
1924, purchase of Australian wheat to replace, *Robson* 55,579.
Admixture of barley, dirt, etc., improvement and small amount of, at present, *Robson* 55,422-3.
Cess on, probable disastrous effect, *Demetriadi* 54,385.
possible Cessation of, in the future, *Robson* 55,491-4.
Character of wheat exported, change in, owing to local consumption, *Pfister* 54,299-300.
Creation of new market for, and competition with wheat from Canada, etc., question of, *Pfister* 54,299; *Demetriadi* 54,301-5.
Decrease, *Demetriadi* 54,391-5; *Robson* 55,413-6.
Demand for, affected by uncertainty as to supply, *Demetriadi* 54,293-4.
Effect of Sukkur Barrage scheme, question of, *Demetriadi* 54,345, 54,348; *Pfister* 54,346-8; *Robson* 55,417.
to England:
Australian competition, *Robson* 55,449-51.
Filling of gap by Indian wheat, *Robson* 55,449-51, 55,516-8.
492 lbs. basis formerly, but change effected to 480 lbs., *Demetriadi* 54,301-4; *Robson* 55,489-90.
Forward buying, method, *Robson* 55,444-7.
Grading system, *Pfister* 54,286-7; *Taylor* 54,289-90.
Increase in quantity and free export of more importance than improvement in quality, *Demetriadi* 54,272, 54,294, 54,298, 54,378-9.
Karachi Fair Average Quality the only standard which counts, *Taylor* 54,315.
London Corn Trade Association contract, *Robson* 55,422, 55,425, 55,435-9.
Marketing on European markets, system, *Robson* (374).
Quality:
Compared with Canadian and Argentine wheat, *Taylor* 54,414-20; *Robson* 55,424.
Deterioration of, from some districts, and causes, *Demetriadi* 54,272-7, 54,349-54, 54,380-4, 54,424-5; *Taylor* 54,355, 54,421-4.
steady Deterioration of, not agreed with, *Robson* 55,481-2.
would Improve if larger crops produced, *Demetriadi* 54,272, 54,294-5.
Sale on "pure" wheat and not "standard" wheat basis, *Lindsay* 54,407-9, 54,460-8; *Demetriadi*, *Pfister* 54,409.
not Sufficient now to have much effect on world prices, *Robson* 55,561-71.

Glutinous, production in India not possible, *Robson* 55,514-5.
Grading, not advocated, *Robson* 55,485-8.
Higher quality, quantity required to secure premium, *Taylor* 54,387-9.
Holding up of stock by cultivators, not desirable policy, *Robson* 55,554-9, 55,571-2.
Improved variety, production of, market would respond to, *Robson* 55,510.
Improvement, work *re*, *Howard* (176), 53,645-6.
Improvement in condition, *Lindsay* (213).
Increased production, importance of, *Demetriadi* 54,272, 54,294, 54,316.

Wheat—*contd.*

Karachi, attempt to improve quality but non-success owing to millers being unable to pay premium, and quantity not worth while, *Demetriadi* 54,288, 54,291, 54,428-32, 54,439; *Taylor* 54,291-2, 54,355.
Local consumption, tendency to increase, *Robson* 55,417.
Marketing, pool system in Canada, *Wilson* (533-5), 56,601-2, 56,607-16, 56,636-54.
Mixture of wheat and of soil, *Pfister* 54,309-10.
Organisation on lines of Indian Cotton Committee, less suitable than for cotton, *Pfister* 54,278-80.
Pooling system, undesirability of, and reasons, *Pfister* 54,281-5.
Prices, comparison with price of wheat from other countries, *Robson* 55,409.
Production, dates in various countries, *Robson* 55,545-53.
Punjab, quality of, *Taylor* 54,433-5.
Qualities required by millers, *Robson* 55,484.
Research, proposal *re* financing, *Lindsay* (212), 53,840-1.
Rust in, Egypt, *Shearer* 54,173-4.
Varieties from other countries, tendency to revert, *Robson* 55,509.
Weeviling, *Pfister* 54,309-10.
Work on, at Cambridge, *Biffen* 57,774-81.

YIELD:
per Acre, and need for increase, *Demetriadi* 54,294.
Average, in Egypt, *Shearer* 54,232.
Low, and comparison with other countries, *Robson* 55,426-8, 55,495-7.

WIGGLESWORTH, Alfred, Chairman of Advisory Committee on Vegetable Fibres, etc.: 54,735-54,853.

FLAX, successful experiments, 54,798.

HEMP:
Acreage statistics, unreliability, 54,805-7.
Baling, need for improvement, and proposal, (303, 303-4), 54,764-7.
Better prices would be obtained by cultivators if in touch with houses of shipment, 54,762.
Development, possibilities of, 54,738.
Dust and dirt in, 54,750-4, 54,813-5.

Export:
Form of contract, 54,768-9.
Prospects of development of, and proposals for, 54,738, 54,742-4, 54,781-2, 54,793-5, 54,852-3.
Standards, imposition not desirable at present, should be left to trade, 54,750, 54,754-5, 54,789-91.
Grading system, 54,755-61.
Improvement, co-operation of Agricultural Department, proposal for, 54,779-80.
Improvement of production by means of cess, proposal, 54,822, 54,825-35, 54,836-9.
Improvement in quality of Indian hemp grown in Italy and possibility of like improvement in India, 54,769-71.
Limit of altitude at which growing of, possible, 54,801-4.
Prices, 54,808-10.
Fluctuations, 54,792.
Quality of, 54,738.
Improving on the whole, 54,774.
Retting, method and proposal *re*, 54,776-9, 54,811-5.
Reputation on the Continent, 54,773.
Soil, importance of preparation, 54,775.
Standards of quality and purity prescribed in London, 54,748-9.
Substitutes, question of, 54,816-21.
Sunn, leaflet issued by a Department of Agriculture *re* cultivation, criticism, Advisory Committee on, (304), 54,942-3.

WIGGLESWORTH, Alfred—*contd.*

HEMP—*contd.*
Value of, difference according to period of pulling and retting, 54,746-7.
Wild, no commercial use possible, 54,796.

IMPERIAL INSTITUTE, Advisory Committee on Vegetable Fibres:
Communication with Indian authorities, 54,741.
Constitution, 54,739-40.

JUTE, 54,846-50.

RHEA, demand for, formerly, but no great production, 54,799-800.

WILLSON, L., Freights Department, Messrs. Ralli Bros.: 54,271-54,475.

WHEAT, bulk storage, no difficulty as regards construction of steamers, 54,312.

WILSON, W. A., Agricultural Products Representative of the Federal Government of Canada: (529-35), 56,570-56,671.

CANADA:
Agricultural education, 56,617-8.
Agricultural legislation, administration and research in, (529-33), 56,573-671.
Contagious diseases, control, (529), 56,619-22.
Co-operative movement, 56,603-8.
Experimental farm system, 56,623-35.
Research organisation, (529-32), 56,573-93, 56,659-61.
Seed distribution to school boys and girls, 56,655-8.
Tobacco cultivation and market, 56,662-8.
Wheat, pool system, (533-5), 56,601-2, 56,607-16, 56,636-54.

WOOD, Professor T. B., and **ENGLEDOW, F. L., M.A.**, School of Agriculture, Cambridge University, (676-683), 57,602-57,756.

AGRICULTURAL SERVICES, recruitment in England, possibilities, (678).

ANIMAL HUSBANDRY, mineral constituents in fodder, importance of, and experiments *re*, 57,742-56.

CAMBRIDGE UNIVERSITY:
Agricultural Science Diploma, memorandum to candidates, (679-82).
Agricultural training, scope of, courses of study, (676-8), 57,652-65, 57,700-8, 57,712, 57,726-7, 57,729.
Indian students' previous training, &c., opinion *re*, 57,616-24, 57,628-37, 57,666-8.
Nutrition experiments, 57,741-6.
Research, training for, (677).
Training for general agriculture and agricultural administration, (678).
Training of Indian agricultural students, considerations and recommendations in connection with, (678-9), 57,606-58.

CROPS, scope for selection, 57,681-2.

RESEARCH:
Colonial Service, supply of workers, recruitment system, and question of prospects, 57,603-5, 57,642-6, 57,671, 57,683-99, 57,721-2, 57,728.
Plant breeding, proposed organisation and danger of specialisation, 57,640, 57,676-82, 57,713-7.
Relationship with teaching, opinion, *re*, 57,735-40.

Workers:
from England:
Long-term engagements would be preferred, 57,603.
possible Supply, question of, 57,603-5, 57,647-51, 57,717, 57,730.
Training of Indians, recommendations *re*, and proposals *re* training abroad, 57,625-9, 57,669-75, 57,718-20, 57,723-5, 57,730-4.

GLOSSARY.

ANNA ... ... One-sixteenth of a rupee; equivalent to 1½d. at exchange rate of one and sixpence to the rupee.
ARTIA (ARTIYA) ... An agent or broker.

BAJRA (i) ... ... A small millet (*pennisetum typhoideum*).
BANJAR ... ... Waste or fallow land.
BARANI ... ... Unirrigated land depending on rain for its water supply.
BATAI ... ... Payment of rent in kind, by division of produce between landlord and tenant.
BERSEEM ... ... Egyptian clover (*trifolium alexandrinum*).
BHITAR BAZAAR ... A jute speculation market in Calcutta.
BIR ... ... An area reserved for the growing of grass.
BUND ... ... A dam, field embankment.

CHIRAGAH ... ... Grazing ground.
CHARKA ... ... A spinning wheel.

DALAL ... ... An agent or broker.
DESI ... ... Native to the country, indigenous.

FEDDAN ... ... An Egyptian measure of land, equivalent to 1·038 acre.

GADDI (shepherd) ... A shepherd by caste as well as by occupation.
GHAT ... ... A mountain or range of mountains.
GHI ... ... Clarified butter.
GUR ... ... Unrefined Indian sugar, jaggery.

HARIALI ... ... A deep-rooted, perennial creeping grass (*cynodon dactylon*).

JAT ... ... The chief cultivating tribe in North-West India.
JOWAR (JUAR) ... The large millet (*sorghum vulgare*).

KANS ... ... A coarse, deep-rooted grass weed (*saccharum spontaneum*).
KANUNGO ... ... A subordinate revenue officer.
KAPAS ... ... Cotton with the seed still adhering (unginned cotton).
KAPOK ... ... Floss obtained from the white silk-cotton tree (*eriodendron anfractuosum*) and the red silk-cotton tree (*bombax malabaricum*).
KHANDI ... ... A measure of weight and capacity which varies according to the commodity and, in many cases, for the same commodity in different localities; for cotton 784 lbs.
KUNDA ... ... A deep-rooted perennial grass weed (*saccharum ciliare*).

LAKH ... ... One hundred thousand.

MALI ... . A gardener, by caste and occupation.
MANDI ... ... A market.
MAUND... ... ... A measure of weight of 82·28 lbs. (standard *maund*); has different values for different commodities and for the same commodity in different localities.
MURRUM ... ... Light, stony soil.

NULLAH ... ... A water course.

PATEL ... ... The head man of a village.

RHEA ... ... A fibre plant (*bœhmeria nivea*), usually grown as a garden crop.
RUPEE ... ... A silver coin of the value of one and sixpence.
RYOT ... ... A cultivator.

SARKAR ...	... The Government, the supreme authority.
SIRDAR... ...	... A man licensed to recruit labour for tea plantations.
SOWCAR ...	... A moneylender.
SUNN (SANN) ...	... Bombay hemp; a leguminous fibre crop (*crotalaria juncea*); also used as a green manure.
SUTTA (SATTA)	... An engagement to supply commodities on consideration of certain specified advances.
TACCAVI (TAQQAVI)	... An advance made by Government to cultivators for agricultural purposes.
TAHSIL... ...	... A local revenue division of a district.
TAL	... A dam.
TIL	... An oilseed (*sesamum indicum*).
TORIA	... Rape (*brassica campestris*).
ZAIL	... A group of villages in a *tahsil*.
ZAMINDAR ...	... A landowner, a peasant proprietor.