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ERIAL COUNCIL OF AGRICULTURAL RESEARCH

Proceedings of the Third Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India

Held at New Delhi from the 20th to the 23rd February 1939.

[WITH APPENDICES]

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1940.

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AGENDA

PERSONNEL AND TIME TABLE.

ANIMAL HUSBANDRY WING

Third Meeting

AGENDA

Statement of action taken on the recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at its second meeting held in December 1936.

1. The etiological factors concerned in pleuro-pneumonia of goats in India.

2. Natural outbreaks of Rinderpest in sheep and goats and their bearing on the general problem of control of this disease.

3. The methods to be adopted for the control of Johne's disease in India.

4. The control of Doyle's (Ranikhet) disease in India.

5. The present position regarding the control of Surra in horses and cattle.

6. A review of the present position in regard to Theileriasis of cattle in India.

7. The application of the results so far obtained in the enquiry on the bionomics of the Warble Fly for the control of this pest.

8. The development of pedigree registration and milk recording.

9. The organisation of the supply of breeding bulls with special reference to His Excellency the Viceroy's Gift Bull Scheme.

10. The formation of breed societies and other lines to be adopted for the improvement of milch cattle and buffaloes.

10 (*a*). The necessity for defining the breed characteristics of certain types of cattle exhibited under breed names.

11. The present position in regard to the salvage of dry city cows and supply of milk to large cities.

12. A review of the progress made in Provinces and States in regard to the resolutions of the Cattle Conference held in May 1937.

13. Practical methods for the improvement and control of grasslands.

14 (*a*). Methods to increase fodder production with the special reference to mixed farming.

(*b*) Tree fodder with special reference to flooded areas.

15. The necessity for the establishment of provincial livestock associations and Cattle Improvement Funds.

16. The improvement of the indigenous breeds of horses.

17. The migration of cattle between Provinces and States with reference to its effect on—

(*a*) the control of contagious disease,

(*b*) the breeding of pure stock.

18. The measures which should be adopted in India in order to comply with international requirements regarding the examination and certification of animal products for export.

19. The correlation between soil deficiencies, poor cultivation, unthrifty cattle and human malnutrition.

ANIMAL HUSBANDRY WING.

Third Meeting.

LIST OF MEMBERS.

	Names and/or Designations.
I.—Imperial Council of Agricultural Research.	1. Vice-Chairman (Chairman, *ex-officio*). 2. Animal Husbandry Commissioner with the Government of India. 3. Agricultural Commissioner with the Government of India. 4. Secretary. 5. Assistant Animal Husbandry Expert. 6. Assistant Agricultural Expert.
II.—Imperial Veterinary Research Institute, Mukteswar.	7. Director. 8. Veterinary Research Officer in-charge of Protozoology. 9. Veterinary Research Officer in-charge of Pathology. 10. Veterinary Research Officer in-Charge of Serology. 11. Officer-in-charge, Biological Products Section. 12. Officer-in-charge, Animal Nutrition Section, Izatnagar. 13. Officer-in-charge, Poultry Research Section, Izatnagar. 14. All other Class I Officers of the Imperial Veterinary Research Institute.
III.—Imperial Agricultural Research Institute, New Delhi.	15. Director. 16. Imperial Agriculturist.
IV.—Imperial Dairy Institute, Bangalore.	17. Imperial Dairy Expert.
V.—Government of Madras ..	18. Mr. T. J. Hurley, Principal, Madras Veterinary College, Madras.
VI.—Government of Bombay ..	19. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay, Poona. 20. Mr. J. N. Mankar, Secretary, Bombay Humanitarian League, 149, Shroff Bazar, Bombay.
VII.—Government of Bengal ..	21. Mr. Chhotaylal Kanoria, 57, Burtollah Street, Calcutta.
VIII.—Government of the United Provinces.	22. Mr. P. B. Richards, I.A.S., Director of Agriculture, United Provinces, Lucknow. 23. Mr. T. J. Egan, I.V.S., Director of Veterinary Services, United Provinces, Lucknow. 24. The Deputy Director in-charge of Cattle Breeding, Jhansi. 25. The Veterinary Investigation Officer, United Provinces, Lucknow. 26. Rai Bajrang Bahadur Singh, M.L.C., Taluqdar, Bhadri Raj, District Pratabgarh, Oudh.
IX.—Government of Bihar ..	27. Mr. D. R. Sethi, I.A.S., Director of Agriculture, Bihar, Patna. 28. Mr. M.I. Malik, M.R.C.V.S., Director of Veterinary Services, Bihar, Patna.

	Names and/or Designations
X.—Government of the Central Provinces and Berar.	29. Rai Bahadur R. V. Pillai, G.B.V.C., Deputy Director of Veterinary Services, Jubbulpore.
	30. Mr. J. V. Takale, L.Ag., N.D. D., Extra Assistant Director, Animal Husbandry, Nagpur.
	31. Mr. Bachan Singh, M.R.C.V.S., Veterinary Investigation Officer, Central Provinces, Nagpur.
	32. Mr. Bhim Singh Govind Singh, M.L.A., Patur, District Akola, Central Provinces.
XI.—Government of the Punjab ..	33. Captain U. W. F. Walker, M.C., M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab, Lahore.
	34. Mr. W. S. Read, Superintendent, Government Cattle Farm, Hissar.
	35. Mr. P. N. Nanda, M.R.C.V.S., Superintendent, Civil Veterinary Department, Rawalpindi.
	36. Mr. J. S. Garewal, M.R.C.V.S., I.V.S., Offg. Principal, Punjab Veterinary College, Lahore.
	37. Dr. P. E. Lander, I.A.S., Agricultural Chemist to Government, Punjab, Lyallpur.
	38. Sardar Bahadur Sardar Datar S ingh, N.D.D., Proprietor, Montogomery Dairy Farm, Montgomery.
XII.—Government of Assam ..	39. Rai Saheb S. C. Ghose, Superintendent, Civil Veterinary Department, Gauhati.
XIII.—Government of the North-West Frontier Province.	40. Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
XIV.—Government of Orissa ..	41. The Assistant Director of Veterinary Services, Orissa, Cuttack.
	42. Babu Birbar Narayan Chandra Dhir Narendra of Madhupur-Garh, P. O. Garh Madhupur, District Cuttack.
XV.—Government of Sind ..	43. Mr. J. H. G. Jorrom, M.R.C.V.S., I.V.S., Director of Veterinary Services, Sind, Karachi.
XVI.—Government of Hyderabad ..	44. Mr. B. K. Badami, Director, Veterinary Department, H. E. H. the Nizam's Govermnent, Hyderabad-Deccan.
	45. Mr. M. R. Mahajan, M.R.C.V.S., Veterinary Investigation Officer, Hyderabad-Deccan.
XVII.—Government of Jammu and Kashmir.	46. Superintendent, Civil Veterinary Department, Govrnment of Jammu and Kashmir, Sringagar.
XVIII.—Government of Mysore ..	47. Mr. S. D. Achar, Superintendent, Mysore Serum Institute, Bangalore.
XIX.—Government of Travancore ..	48. Mr. K. R. Narayana Aiyar, Director of Agriculture and Fisheries, Trivandrum.
	49. Mr. P. K. Ram Krishnan Tampi, Veterinary Superintendent, Trivandrum.
XX.—Government of Bhopal ..	50. Khan Sahib Syed Ghulam Husain, Animal Husbandry Officer, Bhopal.
	51. Dr. H. K. Mehra, M.R.C.V.S. (London), Veterinary Officer, Bhopal.
XXI.—Government of Cochin ..	No nomination received.
XXII.—Government of Baroda ..	52. Mr. R. G. Allan, Commissioner of Agriculture, Baroda.
	53. Mr. Y. N. Marathe, Deputy Director of Animal Husbandry Service, Baroda.

	Names and/or Designations.
XXIII.—Gwalior Durbar	54. Major M. S. Apte, Director of Veterinary Services, Gwalior.
XXIV.—Government of Indore ..	55. Captain B. R. Bingley, Dip. Agric. (Wye), Subha District Rampura-Bhanpura, Garoth.
XXV.—Patiala Durbar	56. Major A. H. Sadik, Director of Agricultural Department, Patiala.
XXVI.—Baluchistan Administration	No nomination received.
XXVII.—Ajmer-Merwara Administration.	No nomination received.
XXVIII.—Army Headquarters ..	57. Brigadier H. C. Dibben, Director of Veterinary Services, India.
	58. Major C. E. Macguckin, M.B.E., Assistant Director of Dairy Farms, Northern Circle, Lahore.
XXIX.—Indian Research Fund Association.	59. Dr. R. K. Pal, M.B., D.Sc., M.R.C.P., F.R.S.E., Liaison Officer, Indian Research Fund Association, Imperial Agricultural Research Institute, New Delhi.
XXX.—Dairy Research Institute ..	Not yet established.
XXXI.—Forest Research Institute, Dehra Dun.	No nomination received.
XXXII.—Inter-Universitity Board ..	60. Dr. M. Damodaran, M.A., D.Sc. (London), D.I.C., F.C.S., Professor of Biochemistry, University of Madras, Madras.
	61. Dr. G. Matthai, M.A., Sc.D. (Cantab.), F.R.S.E., I.E.S., Professor of Biology, University of the Punjab, Lahore.
XXXIII.—National Horse Breeding and Show Society of India.	62. Lieut.-Colonel W. H. Blood, M.V.O., Secretary, National Horse Breeding and Show Society of India, Irwin Amphitheatre, New Delhi.
XXXIV.—Allahabad Agricultural Institute.	63. Principal, Allahabad Agricultural Institute, Allahabad.
XXXV.—Co-operative Interest (Nominated by the Chairman).	64. Sir Chunilal V. Mehta, K.C.S.I., Neville House, Carrimbhoy Road, Ballard Estate, Bombay.
	65. Mr. Mohd. Azhar Ali, M.L.A. (Central), 131, Khiali Gunj, Lucknow.
XXXVI.—General nominations by the Chairman.	66. Veterinary Investigation Officer, Madras, Civil Veterinary Department, Madras.
	67. Veterinary Investigation Officer, Bombay, Civil Veterinary Department, Poona.
	68. Veterinary Investigation Officer, Bengal, Civil Veterinary Department, Calcutta.
	69. Veterinary Investigation Officer, Bihar, Civil Veterinary Department, Patna.
	70. Veterinary Investigation Officer, Punjab, Civil Veterinary Department, Lahore.
	71. Veterinary Investigation Officer, Assam, Civil Veterinary Department, Gauhati.
	72. Veterinary Investigation Officer, North-West Frontier Province, Civil Veterinary Department, Peshawar.
	73. Veterinary Investigation Officer, Sind and Ajmer-Merwara, Civil Veterinary Department, Karachi.
	74. Veterinary Investigation Officer, Orissa, C/o Director of Development, Orissa, Cuttack.

	Names and/or Designations.
XXXVI.—General nominations by the Chairman—*contd.*	75. Mr. James N. Warner, M.Sc., Professor of Animal Husbandry and Dairying, Allahabad Agricultural Institute, Allahabad.
	76. Dr. R. M. Gorrie, D.Sc., F.R.S.E., Deputy Conservator of Forests, Punjab, Lahore.
	77. Dr. V. V. Nighojkar, Veterinary Superintendent, Indore State, Indore.
	78. A nominee of the Director of Veterinary Services, Burma.
	79. Rao Bahadur M. Vaidyanathan, Statistician, Imperial Council of Agricultural Research.
	80. A representative of Messrs. Keventers Ltd.
	81. Mr. K. P. R. Kartha, Statistical Assistant, Animal Husbandry Bureau, Imperial Council of Agricultural Research.
	82. Agricultural Marketing Adviser to the Government of India, Civil Lines, Delhi.
	83. Mr. D. N. Khurody, Marketing Officer, Civil Lines, Delhi.
	84. Khan Saheb A. M. Ulvi, Livestock Officer, Government of Sind, Karachi.

ANIMAL HUSBANDRY WING

Third Meeting

LIST OF AUTHORS OF PAPERS CIRCULATED

Subject No. of the Agenda	Author
1.	Mr. J. F. Shirlaw.
2.	Mr. J. R. Haddow.
3.	Mr. S. D. Achar.
3 Suppl.	Mr. K. K. Sirinivasan.
4.	Mr. M. I. Malik.
5.	Capt. U. W. F. Walker.
6.	Dr. H. N. Ray.
7.	Mr. S. K. Sen.
8.	Mr. K. P. R. Kartha.
8. Suppl.	Mr. M. S. Jung.
9.	Mr. E. J. Bruen.
9. Suppl.	Mr. C. H. Parr.
10.	Mr. Wynne Sayer.
11.	Mr. Zal R. Kothavalla.
11 Suppl.	Mr. M. S. Jung.
12.	The Council.
13.	Dr. W. Burns and Mr. W. S. Read.
13. Suppl.	The University Biochemical Laboratory, Madras.
14.	(*a*) Mr. M. S. Jung.
	(*a*) Suppl. Dr. N. D. Kehar.
	(*b*) Government of Orissa, Indian Forest Research Institute and the Council.
15.	Mr. P. J. Kerr.
16.	Mr. H. B. Shahi.
17.	Mr. T. J. Hurley.
18.	Mr. E. S. Farbrother.
19.	Dr. P. E. Lander.
19 Suppl.	Dr. B. K. Mukherjee. and Mr. K. R. Narayana Iyer.

ANIMAL HUSBANDRY WING

Third Meeting

Committees

PERSONNEL AND AGENDA

1. COMMITTEE FOR BACTERIAL AND VIRUS DISEASES OF ANIMALS

(*a*) PERSONNEL—

1. Animal Husbandry Commissioner with the Government of India—*Chairman.*
2. Mr. R. L. Kaura—*Rapporteur.*
3. Mr. J. R. Haddow.
4. Mr. J. F. Shirlaw.
5. Mr. M. I. Malik.
6. Brigadier H. C. Dibben.
7. Mr. Riazul Hasan.
8. Rai Bahadur R. V. Pillai.
9. Mr. P. N. Nanda.
10. Mr. T. J. Hurley.
11. Mr. N. Chatterji.
12. Mr. Ramakrishna Tampi.
13. Veterinary Investigation Officer, United Provinces.
14. Veterinary Investigation Officer, Madras.
15. Veterinary Investigation Officer, Bombay.
16. Veterinary Investigation Officer, Bengal.
17. Veterinary Investigation Officer, Bihar.
18. Mr. S. D. Achar.
19. Rai Saheb S. C. Ghose.

(*b*) AGENDA—

Items 1, 2, 3 and 4 of the General Agenda.

2. COMMITTEE FOR PARASITIC DISEASES.

(*a*) PERSONNEL—

1. Mr. S. K. Sen—*Chairman.*
2. Dr. H. N. Ray—*Rapporteur.*
3. Mr. T. J. Egan.
4. Mr. J. S. Garewal.
5. Mr. P. B. Richards.
6. Mr. J. H. G. Jerrom.
7. Mr. Bachan Singh.

8. Mr. M. R. Mahajan.
9. Dr. H. K. Mehra.
10. Mr. Y. N. Marathe.
11. Capt. U. W. F. Walker.
12. Veterinary Investigation Officer, Punjab.
13. Veterinary Investigation Officer, Assam.
14. Veterinary Investigation Officer, North-West Frontier Province.
15. Veterinary Investigation Officer, Sind and Ajmer-Merwara.
16. Veterinary Investigation Officer, Orissa.
17. Veterinary Investigation Officer, Hyderabad.

(*b*) AGENDA—

Items 5, 6 and 7 of the General Agenda.

3. COMMITTEE FOR CATTLE BREEDING AND DAIRYING

(*a*) PERSONNEL—

1. Mr. Wynne Sayer—*Chairman.*
2. Mr. H. B. Shahi—*Rapporteur.*
3. Mr. Z. R. Kothavalla.
4. Mr. E. J. Bruen.
5. Mr. D. R. Sethi.
6. Sardar Bahadur Datar Singh.
7. Mr. W. S. Read.
8. Mr. R. G. Allan.
9. Major C. E. MacGuckin.
10. Mr. B. K. Badami.
11. Mr. V. L. Wazir.
12. Mr. J. V. Takle.
13. Mr. Narayana Iyer.
14. Major A. H. Sadik.
15. Mr. J. Warner.
16. Khan Sahib Sayed Ghulam Husain.
17. Mr. T. Murari.
18. Mr. K. P. R. Kartha.
19. Mr. Chotaylal Kanoria.
20. Deputy Director in-charge of Cattle Breeding, Jhansi, United Provinces.

(*b*) AGENDA—

Items 8, 9, 10 and 11 of the General Agenda.

ANIMAL HUSBANDRY WING

Third Meeting

TIME TABLE

February 1939.	Day.	Morning.	Time.	Afternoon.	Time.
20th ..	Monday ..	Opening meeting ..	10-30 A. M.	Committee meetings	2-30 P.M.
21st ..	Tuesday ..	Committee meeting ..	10 A.M. ..	Items 12, 13 & 14 of the Agenda.	2-30 P.M.
22nd ..	Wednesday	Items 15, 16 & 19 of agenda.	10 A.M. ..	Items 17 & 18 of the Agenda.	2-30 P.M.
23rd ..	Thursday	Reports of Committees	10 A.M. ..	Reports of Committees	2-30 P.M.

COMMITTEE REPORTS.

REPORT OF THE COMMITTEE FOR BACTERIAL AND VIRUS DISEASES OF ANIMALS

20th February 1939

Members present :—

1. Mr. P. J. KERR, *Chairman.*
2. Mr. R. L. KAURA, *Rapporteur.*
3. Mr. J. F. SHIRLAW.
4. Captain U. W. F. WALKER.
5. Mr. A. J. MACDONALD.
6. Mr. T. J. HURLEY.
7. Mr. M. CRAWFORD (*Visitor*).
8. Mr. R. K. RAM.
9. Rai Bahadur N. CHATTERJI.
10. Rai Bahadur R. V. PILLAI.
11. Rai Sahib S. C. GHOSE.
12. Mr. P. G. PANDE.
13. Mr. G. R. VISWANATHAN.
14. Mr. BALWANT SINGH.
15. Mr. P. K. RAMAKRISHNAN TAMPI.
16. Mr. S. D. ACHAR.
17. Mr. M. I. MALIK.
18. Mr. BALBIR SINGH.
19. Mr. R. N. NAIK.

The etiological factors concerned in pleuro-pneumonia of goats in India (*Subject No. 1*).

Mr. Shirlaw gave a *resume* of his paper and stated that he believed that there were more than one type of goat pneumonia and that he had studied the helminthic one. He added that in Great Britain *Synthetocaulus rufescens* and *Dictyocaulus vivipacus* were responsible for epizootic pneumonia but in India the parasite commonly encountered in goat pneumonia was *Varestrongylus pneumonicus*. Out of 500 *post mortem* examination reports of cases of goat pneumonia, 407 (*i.e.*, 81·4 per cent) were of verminous pneumonia. Out of 24 specimens of lungs of healthy goats obtained from the local butcher, 18 were pneumonic, some of them showing the presence of worms, and the cultural examination of these specimens revealed the presence of a haemolytic type of *Corynebacterium bovis* in a number of cases. He gave a vivid description of the histo-pathological picture seen in these cases and concluded his remarks with the following statement :—

1. Of all the factors involved more significance should be attached to the presence of worms which if removed would control the disease.

2. Verminous pneumonia with pleural and pericardial effusions, as prevalent in North-West Frontier Province, was also common at Mukteswar and was of considerable importance in the routine and experimental work of the Institute.

3. It is not always possible to demonstrate the worms and bacteria in the consolidated portions of the lungs as they always migrate to the healthy parts.

The Chairman stressed the importance of differential diagnosis from the export trade point of view. He considered that verminous infestation of lungs of goats was as prevalent in India as in Straits Settlement and it may flare up with anything that lowers the vitality of body tissues namely a virus, bacteria, malnutrition, etc. Therefore the latter country, it might be suggested, has really no reason to exclude Indian goats on this account.

Mr. Hurley stated that if the condition was primarily parasitic there would be no outbreaks. He had experienced that the condition was highly infectious in the Madras Presidency where it rapidly spread through herds.

Mr. Crawford stated that in Ceylon, soon after the importation of goats from India, outbreaks of pleuro-pneumonia occurred. The interval between the importation of goats and the occurrence of outbreaks was too short for the transmission and flaring up of a parasitic disease. Pasteurella organisms pathogenic for rabbits and guinea pigs but not for goats were recovered from some cases only. The intravenous injection of N. A. B. gave good results against this form of infectious caprine pleuro-pneumonia.

Mr. Naik stated that outbreaks of goat pneumonia due to pasteurella organisms occurred in the province of Bombay and were controlled with anti-hæmorrhagic septicæmia serum in 15 c. c. dose. He also described the clinical symptoms.

Mr. Macdonald asked whether young goats were more susceptible to which Mr. Shirlaw said " Yes ".

Mr. Viswanathan described the clinical symptoms of cases observed in Madras and stated that *Corynebacterium* has never been isolated at the Madras Veterinary College from the material and diseased goats supplied by him.

Mr. Pillai gave an account of hæmorrhagic septicæmia outbreaks in which goats were also involved.

After a full discussion of the Subject the Committee recommended that :- -

Goat pneumonia is of a very grave importance and the discussion obviously calls for a great deal of more investigations in various centres and exchange of knowledge so obtained and its correlation to hæmorrhagic septicæmia of cattle.

Natural outbreaks of rinderpest in sheep and goats and their bearing on the general problem of control of this diesease (Subject No. 2).

In referring to item No. 2 the Chairman remarked that as sheep and goats were constantly moved from village to village for pasture and manurial purposes, they might play an important role in the spread of the disease amongst

their own species as also amongst cattle. This required further careful investigation so that the control problem may be properly tackled.

Mr. Shirlaw stated that it was difficult to explain why the outbreaks of rinderpest in sheep and goats were so few. Probably the clinical picture and the lesions found on *post mortem* examination were not quite characteristic and very often diagnosis of pneumonia or pleuro-pneumonia was given which resulted from a heavy and apparently universal verminous infestation of the lungs of these animals. *Mr. Crawford* stated that in Ceylon, although cattle were very susceptible to rinderpest yet no outbreak was recorded in sheep and goats. In goats, he further added, he had observed the characteristic mouth and other lesions of rinderpest on two occasions. *Rai Sahib Ghose* gave the account of an outbreak in sheep in a tea garden where he successfully controlled it with anti-rinderpest serum. *Mr. Ram* stated that he had also attended an outbreak in sheep where the common lesions were the congestion of lungs, inflammation in the abomasum and diarrhœa and he stopped the spread of the disease by using anti-rinderpest serum. *Mr. Pande* supported what Rai Sahib Ghose had said and added that on *post mortem* examination lobar pneumonia was commonly observed in such cases.

Mr. Naik gave an account of an extensive outbreak of rinderpest in sheep and goats which was biologically confirmed at Mukteswar. The disease first broke out in cattle and buffaloes and in the latter it was rather unusually severe. It then spread to sheep and goats which showed a temperature of 107°F to 109°F, ulcerations in the mouth, dysenteric blood stained fæces, and eversion of the rectum due to straining. Coccidiosis was eliminated by microscopic examination of the fæces. Mortality was 80 per cent in sheep and 62 per cent in goats. On *post mortem* examination pneumonia and inflammation with necrotic patches in the abomasum and intestine were commonly found. The outbreak was brought under control with anti-rinderpest serum. 2,708 animals were inoculated and amongst them no death occurred, whereas amongst the uninoculated animals there were 483 deaths in sheep and 5 deaths in goats.

Mr. Kaura stated that although natural outbreaks of rinderpest in sheep and goats were clinically diagnosed in Mysore and Poona in 1928 and 1929 respectively but its biological confirmation at Mukteswar had been done only during the last two years when material was sent by the Veterinary Investigation Officers from Bombay, Sind and Punjab. The Bombay strain of the virus was being maintained by passaging the infected spleen tissue, refrigerated for 25 days, through two hill bulls and two sheep every month for more than a year. On the 5th day one bull and one sheep were destroyed for the collection of spleen and the remaining two animals invariably died, thus showing a cent per cent mortality. On account of greater virulence of the sheep strain of the virus potency tests of a routine brew of anti-rinderpest serum were recently carried out at Mukteswar using this virus and the routine bull virus in two different batches of animals and it was found that with the former strain there was about 20 per cent drop in the potency of the serum. An experimental brew of the serum, prepared from animals immunized with the sheep strain of the virus, was being tested in order to see whether its potency would be higher than that of the routine anti-rinderpest serum.

After a full discussion of the subject the Committee made the following recommendations :—

1. Goats and sheep are refractory to natural rinderpest infection but undoubted outbreaks occur. There is evidence that infection can descend from cattle to sheep and goats.

2. This subject is in the early stages of investigation which should be actively continued.

Methods to be adopted for the Control of Johne's Disease in India (Subject No. 3).

Mr. Achar in his opening remarks stated that he would like to add the immediate duties of the workers who were engaged on Johne's Disease investigation to his paper on the subject, and those would be :—

1. To enhance the virulence of the organism by frequent passages through susceptible goats so as to evolve a strain which would give the disease to goats in the shortest possible time and in the most acute manner. He considered it desirable in order to test diagnostic, prophylactic or curative methods and obtain and assess results more definitely and quickly.

2. To study the optimum conditions required for the growth of the organism on artificial culture media and to try to discover the most suitable medium for obtaining the maximum growth in the shortest possible time.

3. To discover a strain of the bacillus which would give a quick and luxuriant growth on such a medium.

4. To discover the cheapest and most reliable disinfectant for application to contaminated byres and infected premises.

He also stressed the beneficial effect of vitamins and minerals in this disease.

The Chairman warned the speaker of the grave consequences which may follow the exaltation of the Johne's bacillus if it was not kept strictly confined to the place of research. He further stated that it was a disease of domestication and with the increase of dairy farming it might gain prominence in dairy cattle unlike the ranch cattle. He pointed out that the main difficulty in the control of that disease was that the positive reactors could not always be destroyed due to religious and sentimental objections and the disease being a chronic one the innfected animal disseminated the disease for a very long period. Such infected animals could not be sent to Pinjrapoles where probably more useful animal husbandry work could be done. *Rai Sahib Ghose* stated that the external appearance of an infected animal was not a correct guide to the degree of infection. Apparently healthy animals which reacted positively to avian tuberculin showed on *post mortem* examination typical lesions teaming with the causative organism. He considered that the 'Churn' brand of mineral flour has some beneficial effect in the control of that disease.

Mr. Shirlaw referred to the Johne's Disease herd kept at Mukteswar for the study of the evolution of the disease, its transmission, and testing of vaccines and diagnostic agents. He stated that the disease was not a progressive one in India, unlike in England, and the typical intestinal lesions were not always to be found in positive cases. He added that sometimes infected animals failed

to give a positive reaction to avian tuberculin and recommended the use of Glover's new Johnin and repeated direct fæcal examinations, following a dose of croton oil. He also stated that the results of Valle and Ringard's vaccine as tried at Mukteswar were equivocal if not disappointing. *Mr. Hurley* stated that material received at the Madras Veterinary College showed that at least 20 per cent of the positive cases came from villages. He stressed that more material should be sent from clinically suspected cases from villages to the Provincial laboratories in order to determine the incidence of the disease in various Provinces so that measures of control may be adopted accordingly. *Mr. Balbir Singh* stated that out of five positive cases on which he performed *post mortem* examinations, only two showed the typical lesions. Mr. Pande supported what Rai Sahib Ghose had said. *Mr. Naik* stated that in the Province of Bombay the disease had been introduced into Agricultural farms with animals which were imported from Military dairy farms where foreign bred and cross bred cattle were kept and the disease existed and in his opinion the disease was imported from abroad. He added that he had not so far seen a case of the disease in village cattle and that the sale of animals from infected farms should be prohibited and affected animals destroyed, if possible. *Mr. Balwant Singh* stated that he tested twenty-five animals with D. I. D. tuberculin test and found that three and two reacted positively to avian tuberculin and ordinary tuberculin respectively. *Mr. Kaura* referred to a bull that was purchased by the Mukteswar Institute from the interior of the Garhwal hills, where the possibility of contracting the infection from animals imported from overseas was remote and was confirmed as a case of Johne's disease. He further stated that the results of Johnin prepared from Dunkin's synthetic medium at Mukteswar had not given as satisfactory results as were anticipated and that so far as the results of the allergic tests were concerned an animal giving a positive reaction should be taken as definitely infected and it need not be retested as was suggested by another member but a negative reaction should be taken with a caution particularly if there be a clinical evidence of the disease.

The Committee, after discussing the subject fully, recommended that—

(1) Further investigation as to the incidence of the disease in the villages is necessary.

(2) The question of the disposal of positive reactors should form the subject of future discussions, as slaughter of such animals is impracticable.

(3) Diagnostic tests are at present not very reliable but the Double Intradermal test may be continued and it should always be confirmed by fæcal examination.

Control of Doyle's (Ranikhet) disease in India (Subject No. 4).

Mr. Shirlaw in opening the discussion stated that recent work done at Mukteswar on prophylaxis was similar to Doyle's work. It was not possible to attenuate the virus by the various known methods. There was an end-point at which the virus was either fully virulent or dead. He considered that the only available method of its control was quick diagnosis and immediate destruction of affected birds, rigid segregation of birds in small batches and thorough disinfection of the premises and fittings. He added that in the event

of an outbreak regular temperature recording would be very helpful in the early detection of affected birds. He recommended the use of camphor in olive oil (1—4) in this neurotropic disease as it is a stimulant for the nerve centres. He also pointed out that the paralytic stage of the disease should be differentiated from that of fowl-spirochætosis by examining blood smears in the febrile stage of the disease and not after death.

The Chairman remarked that Mr. Shirlaw's recommendations for stamping out the disease in early stages supported the actions taken by Messrs. Bruen and Gossip in the control of the disease in Bombay and Bengal.

Mr. Hurley stated that some of the outbreaks suspected of pseudo-fowl-pest (Doyle's disease) may be due to fowl-pest which has not so far been authentically reported from India. *Mr. Ram* remarked that although it was commonly stated in literature that in Doyle's disease one usually finds no lesions on *post mortem* examination yet he found extensive necrotic lesions and ecchymoses all through the intestines and observed severe nervous symptoms. *Mr. Crawford* supported temperature recording as a means of early diagnosis and stated that the percentage of mortality in the disease was now-a-days less than that observed in 1927. *Mr. Kaura* stated that symptoms and lesions varied according to severity of the case. In peracute cases there was quick death and almost no lesions were seen, in ordinary acute cases the usual syndrome of the disease was observed with the characteristic lesions in the proventriculus and intestines and in subacute cases nervous symptoms were quite commonly observed. He referred to the attempts that were being made for the preparation of a suitable vaccine and the attenuation of the virus by passage through unsuitable hosts like guinea-pigs and rabbits. He added that the contents of an egg of an infected hen were infective, and the chicks of Doyle's-disease-recovered hens were as susceptible to the disease as other chicks. He further stated that the biological test as carried out at Mukteswar would establish the identity of Doyle's disease beyond doubt.

Mr. Macdonald stated that a rise of 2 or 3 degrees in temperature would be a normal fluctuation in poultry. He agreed that stampting out by slaughter of the affected birds with rigid segregation and prevention of infection through imported birds was the best method at the moment, for its control. He believed that the newer generations of poultry were comparatively more resistant to the infection.

Mr. Naik stated that there was no difference in susceptibility of foreign breeds and the Indian fowls. He added that breeding of fowls under segregation was the only successful method by which this disease could be avoided.

After full consideration of the subject the committee recognised that :—

It is a disease which has been subjected to research for many years in other countries with little positive results, but a vast array of negative information. Although a special officer from India is under training in the United Kingdom and will presently join the ranks of investigators in this country, it must not be expected that he will promptly succeed in an investigation in which so many first-rate workers have not succeeded.

R. L. KAURA,
Rapporteur.

REPORT OF THE COMMITTEE ON PARASITE DISEASES OF ANIMALS

Monday, the 20th February 1939

Members present :—

1. Mr. S. K. SEN, *Chairman.*
2. Dr. H. N. RAY, *Rapporteur.*
3. Mr. H. S. BAWA.
4. Mr. S. R. CHADHA.
5. Mr. T. J. EGAN.
6. Mr. J. S. GAREWAL.
7. Mr. J. H. G. JERROM.
8. Mr. H. R. KAPUR.
9. Mr. W. M. KHAN.
10. Mr. P. S. KUPPUSWAMY.
11. Mr. M. R. MAHAJAN.
12. Mr. Y. N. MARATHE.
13. Dr. H. K. MEHRA.
14. Mr. S. M. A. SHAH.
15. Mr. BACHAN SINGH.
16. Captain U. W. F. WALKER.

Present position regarding the control of surra in horses and cattle in the Punjab (Subject No. 5).

The Chairman in opening the proceedings remarked that it so happened that all the three items on the agenda before the Committee were of topical interest, being at present the subjects of active investigation in India and that he, therefore, hoped that the discussions would not only be concerned with broad generalizations but would also enter into the sphere of specific details as to the future line of work, so that the findings of the Committee might be readily acted upon by those engaged in the prosecution of these investigations.

Dealing with subject No. 5, the Committee deplored the fact that during the past fifteen years researches into the chemotherapy of surra have been exclusively concerned with the determination of the remedical and prophylactic properties of Naganol, a proprietory drug which, on account of its high cost, was not within the reach of the average stock-owner in this country, although they recognized that, in the absence of a less expensive but equally efficacious remedy, it was only possible to continue the present investigations directed to perfecting the *rationale* of treatment with their drug. The Committee stressed the desirability of coming to a definite conclusion concerning the question whether acute cases of bovine surra in India are attributable to *Trypanosoma evansi* (which is normally innocuous for the bovine species) or to a virulent variant of the species of *Trypanosoma* and also whether the so called ' circling ' or *bhora* disease of bovines may occur as a symptom of surra itself or is to be regarded as a different disease entity, although frequently occurring concurrently with surra.

After full discussion of the subject, the Committee made the following recommendations :—

(1) That the investigation of bovine surra should be included as an item of special importance in the future programme of work for the Veterinary Investigation Officers in India.

(2) That in view of the high cost of Naganol, an investigation should be undertaken to explore the possibilities of less expensive drugs in the treatment of surra, and that, if necessary, efforts should be made to secure the collaboration of one or more leading firms of chemists in this connection.

(3) That in the meantime the Bayer Company should be addressed concerning the possibility of reducing the price of Naganol so as to bring the drug within the reach of the average stock-owner in this country.

(4) That a series of intensive investigations should be undertaken to determine (*a*) the minimum effective dose of Naganol in the prophylactic treatment of equine surra ; (*b*) the relative therapeutic value of Naganol alone and Naganol *cum* Tartar-Emetic method in the treatment of both acute and chronic cases of this condition.

(5) That in those areas where surra is prevalent, arthropod surveys should be undertaken, in collaboration with the Mukteswar Institute, with a view to formulating a working hypothesis concerning the species of vectors involved in the spread of the disease and that, in the meantime, measures should be taken in selected surra areas for the desrtruction of the egg clusters of Tabanids, which are now known to be the most common vectors of the disease.

Tuesday, the 21st February 1939.

Members present :—

1. Mr. S. K. Sen., *Chairman.*
2. Dr. H. N. Ray, *Rapporteur.*
3. Mr. H. S. Bawa.
4. Mr. S. R. Chadha.
5. Mr. T. J. Egan.
6. Mr. J. S. Garewal.
7. Rai Sahib S. C. Ghose.
8. Mr. J. H. G. Jerrom.
9. Mr. H. R. Kapur.
10. Mr. W. M. Khan.
11. Mr. P. S. Kuppuswamy.
12. Mr. M. R. Mahajan.
13. Mr. Y. N. Marathe.
14. Dr. H. K. Mehra.
15. Mr. P. G. Pandey.
16. Mr. R. K. Ram.
17. Mr. P. B. Richards.
18. Mr. S. M. A. Shah.

19. Mr. BALBIR SINGH.
20. Mr. BALWANT SINGH.
21. Mr. BACHAN SINGH.
22. Mr. J. F. SHIRLAW.
23. Captain U. W. F. WALKER.

A review of the present position in regard to Theileriasis of cattle in India (Subject No. 6).

In dealing with this comparatively new subject in the field of veterinary science in India, the Committee realised that any conclusions that might emerge in the course of the discussion could only be of a tentative character, in view of the fact that little exact information is available concerning the extent to which bovine theileriasis represented a disease entity of major importance in this country.

The Committee after full consideration of the subject made the following recommendations :—

(1) That the veterinary departments of the Provinces and Indian States should be invited to collaborate with the Mukteswar Institute in an investigation into the incidence of bovine theileriasis in India by forwarding to that Institute blood and gland smears from animals that have succumbed to or recovered from blood-borne protozoan infections.

(2) That a series of controlled cross-immunity tests should be undertaken to determine the relationship between East Coast Fever and acute forms of theileriasis in India but that these tests should preferably be carried out in a locality where East Coast Fever is definitley known to be prevalent.

(3) That in the matter of experimental work on the treatment of acute theileriasis special attention should be given to those members of the Sulphanilamide group which are of proved efficacy for certain analogous disease conditions in the human subject.

The application of the results so far obtained in the enquiry on the bionomics of the Warble Fly for the control of this pest (Subject No. 7).

The Committee considered that the investigation into the life-history and bionomics of the ox Warble Fly in India has now progressed to a stage when measures for the control of this pest may be usefully adopted in selected areas and that these measures should at present consist in the application of lime-tobacco dressings, which are reported to have been used with considerable success on the Hissar Farm in combating the pest. In regard to the Warble Fly of the goat, the Committee were of opinion that the formulation of combative measures against it should be postponed until the acquisition of fuller information concerning the life-history of the pest.

The Committee felt greatly interested in the question of the damage caused to hides by ticks in India and recommended that immediate steps should be taken to draw up a scheme of research in this connection for the consideration of the Imperial Council of Agricultural Research.

H. N. RAY,
Rapporteur.

REPORT OF THE COMMITTEE FOR CATTLE BREEDING AND DAIRYING

Members present:—

1. Mr. WYNNE SAYER (*Chairman*).
2. Mr. H. B. SHAHI (*Rapporteur*).
3. Khan Sahib ALI MOHAMMAD Ulvi.
4. Mr. B. K. BADAMI.
5. Mr. E. J. BRUEN.
6. Sardar Bahadur Sardar DATAR SINGH (21st February only).
7. Mr. MAQSUD-ULLA S. JUNG.
8. Mr. K. P. R. KARTHA.
9. Mr. W. KEVENTER.
10. Mr. D. N. KHURODY.
11. MR. ZAL R. KOTHAVALLA.
12. MR. J. N. MANKAR.
13. MR. K. R. NARAYANA AIYAR.
14. Major A. H. SADIK.
15. Mr. J. V. TAKALE.
16. Prof. JAMES N. WARNER.
17. Mr. V. L. WAZIR.

Visitors.

1. Dr. V. V. NIGHOJKAR.
2. Capt. B. R. BINGLEY.
3. Dr. R. MACLAGAN GORRIE (21st only).
4. Dr. N. D. KEHAR.

Organisation of the supply of breeding bulls with special reference to His Excellency the Viceroy's Gift Bull Scheme (Subject No. 9).

The subject was discussed at length and the Committee observed that :—

1. They recognised the difficulties and expense attendant on rearing good dairy bulls and recommended that all agencies which could, in the opinion of the Live-stock Department, be profitably employed on this work should be subsidised.

2. They were also of the opinion that all possible agencies should be employed to facilitate the production of pedigree bulls for milch and draught, and draught only, and

3. Further in view of the danger caused by indiscriminate location of bulls purchased under the Viceroy's Gift Bull Scheme, they were of the opinion that all donors should be informed that the selection and location of bulls purchased from such donations should be controlled by the local Live-stock Department.

The present position in India with regard to the salvage of dry city milch-stock and supply of milk to large cities (*Subject No. 11*).

After a detailed discussion on the problem of salvage of dry milch cattle from cities, the Committee observed with regret that no effective action had so far been taken on the previous recommendations made by the Committee which dealt with this subject in 1937 and felt that no useful purpose could be served by further reiterations and resolutions along these lines. In view of the urgency and importance of the matter, they considered that a speical small committee of people, closely associated with the subject, should be appointed to investigate the question on the spot at the three Presidency towns and endeavour to elucidate a course of action which would be assented to, and co-operated in, by the authorities concerned.

The formation of breed societies and other lines to be adopted for the improvement of milch cattle and buffaloes (*Subject No. 10*).

The Committee felt that if Herd Books and registration of Indian breeds of cattle were to be made a success, it was essential that *breed societies* should be formed to work in the interests of breeders. At the same time the Committee recognised the fact that owing to the circumstances of the breeders Government assistance and a small subsidy would be essential for some years after the breed society was formed.

The necessity for defining the breed characteristics of certain types of cattle exhibited under breed names [*Subject No. 10* (*a*)].

The Committee considered that this subject could be best dealt with as Item 10 (*a*) in the Agenda. They observe that in view of the large numbers of grey breeds of cattle which had not yet been classified by definite breed characteristics, it was felt that a committee of experts of long experience of cattle in India should be set up by the Imperial Council of Agricultural Research for a period of 18 months to convene these breeds and make recommendations. It was suggested that Messrs. Bruen, Gossip and Henderson be asked to undertake this work at the end of their service and that Mr. Zal. R. Kothavalla be co-opted if possible. Further the Committee considered that it would be advantageous if selections of these types could be shown finally at the All-India Cattle Show at the end of the enquiry.

The development of pedigree registration and milk recording (*Subject No. 8*).

The subject was discussed in detail. The Committee considered that pedigree registration and milk recording were of great importance for the improvement of livestock and stressed the essential point that milk recording must be conducted with great accuracy and uniformity of method as its value was of the greatest influence on the position of pedigree registration. It was further recommended that all methods of encouraging milk recording, such as establishment of milk collecting centres, etc., should be assisted in every way possible.

H. B. SHAHI,
Rapporteur.

PROCEEDINGS.

PROCEEDINGS—20th FEBRUARY, 1939.

The following were present :—

1. Sir BRYCE BURT—*Chairman.*
2. Mr. S. D. ACHAR.
3. Major M. S. APTE.
4. Mr. B. K. BADAMI.
5. Mr. H. S. BAWA.
6. Capt. B. R. BINGLEY.
7. Rao Bahadur B. VISWANATH.
8. Mr. E. J. BRUEN.
9. Dr. W. BURNS.
10. Rai Bahadur N. CHATTERJEE.
11. Mr. S. R. CHADHA.
12. Mr. T. J. EGAN.
13. Mr. J. S. GAREWAL.
14. Rai Saheb S. C. GHOSE.
15. Mr. J. R. HADDOW.
16. Mr. T. J. HURLEY.
17. Mr. K. R. NARAYANA IYER.
18. Mr. J. H. G. JERROM.
19. Mr. M. S. JUNG.
20. Mr. H. R. KAPUR.
21. Mr. K. P. R. KARTHA.
22. Mr. R. L. KAURA.
23. Mr. P. J. KERR.
24. Mr. W. KEVENTER.
25. Mr. W. M. KHAN.
26. Mr. D. N. KHURODY.
27. Mr. ZAL. R. KOTHAVALLA.
28. Mr. P. S. KUPPUSWAMY.
29. Dr. P. E. LANDER.
30. Mr. A. M. LIVINGSTONE.
31. Mr. G. J. MACDONALD.
32. Mr. M. R. MAHAJAN.
33. Mr. M. I. MALIK.
34. Mr. J. N. MANKAR.

35. Mr. Y. N. MARATHE.
36. Dr. H. K. MEHRA.
37. Mr. R. N. NAIK.
38. Babu BIRBAR NARAYAN CHANDRA DHIR NARENDRA OF Madhupur-Garh.
39. Dr. V. V. NIGHOJKAR.
40. Dr. R. K. PAL.
41. Mr. P. G. PANDEY.
42. Rai Bhahdur R. V. PILLAI.
43. Mr. R. K. RAM.
44. Dr. H. N. RAY.
45. Mr. P. B. RICHARDS.
46. Major A. H. SADIK.
47. Mr. WYNNE SAYER.
48. Dr. K. C. SEN.
49. Mr. S. K. SEN.
50. Rai Bahadur R. L. SETHI.
51. Mr. S. M. A. SHAH.
52. Mr. H. B. SHAHI.
53. Mr. J. F. SHIRLAW.
54. Mr. BACHAN SINGH.
55. Rai BAJRANG BAHADUR SINGH.
56. Mr. BALBIR Singh.
57. Mr. BALWANT SINGH.
58. Mr. BHIM SINGH GOVINDH SINGH.
59. Mr. J. V. TAKALE.
60. Mr. RAMKRISHNA TAMPI.
61. Khan Sahib A. M. ULVI.
62. Rao Bahadur M. VAIDYANATHAN.
63. Mr. G. R. VISWANATHAN.
64. Capt. U. W. F. WALKER.
65. Mr. JAMES N. WARNER.
66. Mr. V. L. WAZIR.

Mr. S. BASU, *Secretary.*

Visitors :—

1. Mr. M. CRAWFORD.
2. Dr. N. D. KEHAR.

The proceedings were opened at 10-30 A.M. by Kunwar Sir Jagdish Prasad, K.C.S.I., C.I.E., O.B.E., the Hon'ble Member in charge of the Department of Education, Health and Lands, who spoke as follows :—

GENTLEMEN,

I extend to you a warm welcome not only because I happen to be the Head of the Department in the Government of India with which your activities are associated, but also because I have a strong personal conviction that the labours of those like yourselves with a wide knowledge and experience of matters of animal husbandry are of fundamental importance to the present well being and future prosperity of my country.

India has about 317 millions of domesticated animals ; and the annual value of animal products reaches astronomical figures. While something has been done to control diseases, specially rinderpest, and to improve the breeding and feeding of stock, there is still great scope for improvement on scientific lines. This is a task in which the Centre, the Provinces and the States can work together. In a vast country like India it is essential that workers in different parts of the country should have opportunities of meeting each other at regular intervals in order to preserve a continuity of outlook and a disposition to co-operation, and to check any tendency towards provincial separatism and compartments. In accordance with what I regard as an admirable custom you alternate your meetings between the Provinces and the Government of India.

You are described as a " Wing ". So far as I know, wings go always in pairs and your twin, as it were, deals with crops and soils. Even here I would like personally the view-point to be preserved, of these two wings as something which meet in a common body and not as limbs that function independently. For, all, the rearing of animals and the use of the soil are inseparably connected each influencing the other.

The Imperial Council of Agricultural Research with which you are linked provides an efficient means by which your recommendations can be translated into practice.

Even a coursory glance at the papers before you indicates the considerable progress which has been made during the six years which have elapsed since the first meeting of the Animal Husbandry Wing was held. The scope and activities of the Imperial Veterinary Research Institute have been increased and the Council is financing a number of schemes dealing with disease investigation, animal breeding, animal nutrition and the better production of fodder crops. And here I note with particular pleasure that you propose to devote special attention to the better feeding of cattle, for on it depends better breeding. The Central Fodder and Grazing Committee which has been constituted, as a result of your recommendations, is primarily concerned with improvements in the feeding of cattle.

I should like to turn for a moment to some of the causes which in my view have hindered progress. We had hitherto no precise and complete description of the main breeds of cattle in this country. This defect has been recently removed by Sir Arthur Olver's bulletin and by a more recent bulletin which is to form the basis of pedigree registration. The All-India Cattle Show will also enable cattle breeders and others interested in Cattle Improvement to

see for themselves the splendid specimens that India can produce. Thanks to the initiative and interest of His Excellency the Viceroy, the Cattle Show will, I hope, become a permanent feature in the life of the Imperial City and a potent means for the improvement of Indian Cattle. A second cause is the lack of facilities for higher professional education. We have a number of high grade institutions for the study of Law, Arts, Medicines and Engineering but none for the Veterinary Sciences. I trust that it will not be too long before this very obvious blemish is removed from the educational system of our country. A third cause is that our system of education has hitherto had a marked urban bias. The educated Indian as a class is, therefore, not what I might call animal-minded. He is not sufficiently interested in animal life. He is apt to regard discussions about the improvement of animal breed with amused indifference and often with contempt. He regards such topics, very often, as vulgar and hardly deserving serious attention from those immersed in the subtleties of higher metaphysics and the niceties of literary criticism. But I am glad to note that a welcome change in outlook is noticeable, and in bringing it about the knowledge and enthusiasm and the example of His Excellency the Viceroy have played a notable part. He has done immense service in bringing home to us the dimensions and the importance of the problem of animal husbandry. Most Provinces have provincial and district livestock improvement associations. I trust that the impetus to cattle improvement given by His Excellency the Viceroy will abide.

I will not detain you any longer and will leave you, Gentlemen, to discuss your diversified and very full agenda, confident in the belief that your deliberations will help to preserve and improve our noted breeds, to better our agriculture and to increase the supply of animal products of good quality so essential to the proper nourishment of our people.

The Hon'ble Kunwar Sir Jagdish Prasad then left.

The Chairman of the Board (*Sir Bryce Burt*) in welcoming the members of the Animal Husbandry Wing said that all present missed two familiar faces, Sir Arthur Olver and his successor Mr. F. Ware who also was an original member of the Board. It was not necessary for him to remind the Board of what Sir Arthur Olver had done for Animal Husbandry in India but he felt sure that all present would wish that a message of greetings should be sent to him from the Animal Husbandry Wing. Mr. Ware who had done much of the preparatory work for the Meeting was on leave in England due to ill-health and he was glad to say that Mr. Ware was very much better and hoped to return to India very soon. He felt sure that the Board would also like to send him a message of greetings.

This was carried with acclamation.

The Chairman announced that the Committees of the Board would sit simultaneously on the afternoon of Monday and on the forenoon of Tuesday, and that the full Board would meet on the afternoon of Tuesday. Meanwhile he would take up some general items on the agenda.

A review of the progress made in Provinces and States in regard to the resolutions of the Cattle Conference held in May 1937 (*Subject No. 12*).

The Chairman said that at each meeting of the Animal Husbandry Wing it was customary to review the action taken on recommendations of the last

meeting and this particular item dealt with the progress made in regard to the resolutions of the Cattle Conference held in May 1937. At the second meeting of the Animal Husbandry Wing at Madras, a number of important recommendations dealing with livestock improvement were made. Subsequently, the Government of India called an all-India Cattle Conference which met in May 1937 and was attended by the Ministers from the autonomous Provinces and several Indian States and their technical advisers. This conference considered a number of the Board's recommendations and passed several important resolutions. He drew attention to the circulated papers and particularly to the summary of the replies received from Local Governments and Administrations showing the action taken on four recommendations of the Cattle Conference, *viz* :—

(1) The setting up of suitable provincial improvement Funds,

(2) The Improvement of grasslands,

(3) The need for increased personnel, and

(4) Crop planning.

All these items formed separate items on the agenda of the Board but before the sub-committees took up the detailed consideration of the separate subjects the Board would like to know the present position. It was possible that the provincial representatives might have something to add to the information tabulated in the circulated papers.

As regards resolution No. 1, the Chairman said that the Research Council had made an attempt to see what the result of His Excellency the Viceroy's appeal had been upto 31st March 1938. The statement received from the Provinces showed that the number of stud bulls donated was 1,357 and Rs. 3½ lakhs was donated in cash either for the purchase of bulls or for maintenance. The figures from the Central Provinces had not been received and therefore some addition had to be made to the above figures. Roughly speaking, the number of additional bulls obtained as a result of this appeal was, that, in the Punjab, there was an addition of 738, in the United Provinces 204 were receiving maintenance grants and in Assam 46 bulls were bought in addition to the 263 shown as gift. The Chairman estimated that about 3,400 bulls of good quality had been donated in response to His Excellency's appeal. *Mr. Kerr* said that Bengal had a total of 1,500 bulls in that Province and the number of gift bulls was 68. The Board noted that the figures received from the Provinces showed a considerable advance on the figures shown in the last Annual Report of the Research Council.

The Chairman further observed that the figures in connection with the progress made in registration of cattle were incomplete. He said that information had been received from the Punjab only and in that Province they had 719 Cattle Improvement Societies under the Co-operative and Veterinary Departments with about 15,000 members and 19,500 registered cows. In Bombay also a great deal of progress had been made in the registration of cows. He added that His Excellency the Viceroy had always laid great stress on the registration of improved cattle and the available figures indicated a definite advance. The Chairman requested the members to state the present position in their Provinces.

Mr. Hurley (*Madras*) said that there was not much reponse in Madras and the total number of bulls was about 300. The Provincial Government had very little money allotted for this purpose.

Mr. Bruen (*Bombay*) said that registration of improved cattle was being carried out in the areas in which he was working but he was not aware of the position in other places which were in charge of the Deputy Directors of Agriculture. As a result of His Excellency's appeal they had added 550 bulls to their existing strength and had Rs. 39,000 still available for this purpose. As regards registration in the rest of the province, he said that he was going to tackle the problem piecemeal and not all at once. In answer to a query from the Chairman, Mr. Bruen said that in Bombay the registration of improved stock was being carried out only by the Animal Husbandry section of the Agricultural Department. He added that as a result of the gift bulls scheme, considerable difficulty was being experienced in maintaining the existing premium system in the Province. The main drawback experienced was that the people who had been working on the premium system had still to purchase a bull, whereas a cultivator who had not taken to this system was now given the services of a bull free of any charge. The Chairman remarked that this was a local problem.

Mr. Bruen further added that the figures supplied by him did not take into account the bulls purchased out of the grant from the Government of India for rural uplift work.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that in Bengal they received 63 gift bulls and in addition, on the recommendation of the Animal Husbandry Committee, bought 1,500 bulls from the Government of India rural uplift grant. The intention was to provide 100 approved bulls to each of the 15 districts selected by them without premia. This scheme had been well received and they had distributed 1,000 bulls two years ago and the balance of 500 were distributed last year. So far they had 20 casualties amongst the 1,500 bulls. Mr. Kerr added that the bulls had been bought in the Punjab and have proved satisfactory.

The Chairman said that the Council would indeed be grateful if the provincial representatives would supply the information that would be called for shortly in regard to the progress made in respect of the registration of improved cattle in the Provinces.

Mr. Richards (*United Provinces*) said that the response in regard to the gift bulls was not very great in the United Provinces. That was probably due to the fact that there was already considerable provision for the issue of bulls on contributory system. Actually a comparatively small contribution was made by landlords and in order to overcome the difficulty, which for instance, Bombay had encountered, it was arranged that the gift animals would be dealt with precisely in the same manner as the departmentally distributed bulls, under which a villager or a Zemindar paid a contribution of Rs. 22 for services of the bull during its life but the bull remained the property of the Government.

Up to 1935-36 the provision for purchase of bulls for distribution was Rs. 25,000. In 1936-37 Government raised it to Rs. 50,000 for purchasing bulls mostly in the Punjab. In addition, there were cattle breeding farms

from which pedigree stock was issued for special grading up work in the villages. In the current year's budget the provision for purchase of breeding stock is Rs. 1,50,000 including Rs. 30,000 grant from the Rural Development Fund for the purchase of good cows. The number of bulls issued during the preceding three years prior to the present drive ranged between 450 and 600. In 1936-37, 700 bulls were issued; in 1937-38, 900 and this year's estimate is about 1,200. The object aimed at was an annual issue of between 2,000 to 3,000 bulls. How soon they would be able to work up to this ideal depended on the activities of the Rural Development Association and the staff of the Veterinary Department and also of course on the availability of suitable stock of good quality either in the Punjab or in the districts in which village herds were being graded up and where a stage had now been reached when it would be possible to buy local stock for distribution with a reasonable degree of certainty regarding its quality.

As regards registration they were perhaps somewhat backward, as they were still in the grading-up stage and the difficulty was that a majority of the village herds had not yet reached the stage which could be considered suitable for registration. A beginning had, however, been made so far as pedigree milch herds were concerned and registration work had commenced in the village herds in the Muttra district.

Captain Walker (*Punjab*) said that he had very little to add except that it was hoped to increase the number of gift bulls by another 200.

As regards pedigree registration it had recently been started for the Sahiwal breed in the Montgomery District and Jalalabad tract of the Ferozepore District, for Dhanni breed in the Rawalpindi Division, and the Hariana breed would be taken up in the Hariana tract of the Punjab as soon as the scheme which is to be financed by the Imperial Council of Agricultural Research is approved.

Mr. Malik (*Bihar*) said that the Director of Agriculture who was not present at the meeting, was in charge of the livestock improvement work in Bihar. His information was that money had been set apart for the purchase of bulls but Government had not yet decided their cattle improvement policy. It was not known which breed of cattle they would purchase for the improvement of livestock in the Province.

Mr. Takale (*Central Provinces*) said that about 561 pure-bred bulls were in service in the Central Provinces ; out of these about 331 bulls were presented in response to His Excellency the Viceroy's appeal and 163 were purchased from the funds allotted by the Central Government. He added that Hariana breed was being introduced in Berar, Malvi in northern districts of the Province, and the Sahiwal in the urban areas. In reply to the Chairman's query whether *Gowalas* Society was still functioning in Nagpur, Mr. Takale replied that it was, and good progress had been made by this Society in the grading up of the Sahiwal crosses. Further, in reply to Mr. Kerr, he stated that nothing was being done in regard to the Nimari breed. He added that no progress had so far been made in regard to milk recording and pedigree registration but it was hoped that it would be taken up soon.

Rai Sahib S. C. Ghose (*Assam*) observed that Mr. Woodford, who was in charge of the livestock improvement work and could have furnished detailed information, was not present at the meeting. He informed the board that in response to His Excellency the Viceroy's appeal a well organised Provincial Livestock Improvement Association had been formed with His Excellency the Governor of Assam as its President. Functioning under it are a number of Branch Livestock Improvement Associations in all Districts and Sub-Divisions of the Province, with the Deputy Commissioner of the District or the Sub-Divisional Officer of the Sub-Division concerned as the President and the Veterinary Assistant Surgeon or Livestock Inspector as *ex-officio* Secretary. The Associations consisted of both official and non-official members. These Associations were distributing approved bulls within their respective jurisdiction, enlisting paying members, receiving donation of bulls and keeping records of service, where these were possible with the help of the stockmen and Veterinary Assistant Surgeons. The practice of issuing Sindhi and cross-bred Sindhi bulls from the Government farms had to be suspended for the time being on account of the prevalence of Johne's disease at these farms. Nevertheless the progress was maintained by distribution of selected local bulls. With the lowering of the incidence of Johne's disease in the Government farms, farm-bred bulls are being issued again. Bulls were maintained, with or without a subsidy, by the interested and influential public under the guidance and supervision of the livestock Improvement Associations and a fairly large number of bulls were in service. The local Boards were actively co-operating.

Khan Sahib Ulvi (*Sind—nominated by Chairman*) said that in Sind there were three cattle-breeding zones, namely,

(*a*) the left bank of the Indus ;

(*b*) the right bank of the Indus ; and

(*c*) the lower Sind.

The zone under (*a*) possesses a large area under perennial irrigation and is suitable for Tharparkar breed of cattle. In this tract Government were purchasing suitable young Tharparkar bulls and rearing them at a Central Farm for one or two years. As soon as they were considered fit for serving they were issued to approved and selected Zemindars through Cattle Improvement Committees. The number of Tharparkar bulls so far issued within one year was about 50 in Hyderabad, Nawabshah and Tharparkar districts and these bulls were proving quite satisfactory. Their progeny was considerably improved and superior to the local ones.

The zone under (*b*) included portions with hot extreme conditions of climate and was suited to Bhagnari type of cattle. Here young Bhagnari bulls of medium size after being reared in a Central Farm, were distributed amongst Zamindars. At present about three dozens of these were working in this area.

(*c*) The Red Sindhi was being developed in lower Sind and near big cities and towns for urban milk supply and also by breeders. These breeders were mostly nomadic and moved about from place to place for grazing. During the rains they remain in the hills of Thanobullah Khan and later on when

grazing is finished they move along the river bank in the forests. Two dozen bulls of this breed have been issued to Pinjrapoles, selected Zemindars and also Taluqa headquarters. These animals were doing very well. With regard to Government Cattle farms, a nucleus herd of Tharparkar cows had been stationed at the seed Farm at Mirpur Khas but this farm had not yet been turned into a Cattle Farm. It has not yet been decided whether this herd will be maintained at this farm or will be shifted to a new establishment. A herd of Red Sindhi cows has been established at the Willingdon Cattle Farm at Malir near Karachi where pedigree breeding was in progress.

At present pedigree registration work has not been taken up by the private breeders, but as soon as a scheme is introduced and staff appointed it would be given effect to, specially in the case of Red Sindhis and Tharparkar.

Rai Bahadur Chatterji (*Orissa*) said that the Orissa Cattle Breeding Association (now named "Utkal Gomangal Samiti") which was started in October 1936 on the lines suggested by the Animal Husbandry Wing, had opened 31 centres with one Hariana bull at each centre. The cost of maintenance at private centres, which were six in number, was borne by the parties concerned. Cows brought for service were registered and the number served so far was about 700. The number of calves born of these bulls up to 1938 was 99. During 1938, 22 new bulls and 8 cows of the Hariana breed, and 6 Murrah buffalo bulls were purchased. The bulls are intended for distribution in the new centres to be opened in 1939. Buffalo breeding centres would also be established during 1939 with six buffalo bulls, *i.e.*, one at each centre. He further added that, besides the amount of Rs. 21,675 realised from private parties as donations and subscriptions as a result of His Excellency's appeal, a non-recurring grant of Rs. 10,000 and a recurring grant of Rs. 6,500, were got sanctioned from the Provincial Government for this purpose. This money was being spent in the purchase of bulls and their maintenance.

Mr. Badami (*Hyderabad*) said that last year they distributed 46 bulls both Malvi and Deoni, bred on the Government farm. As they experienced difficulty in the maintenance of these bulls in some villages to which they were issued free, they asked for funds from Government.

Village improvement societies had been started in 86 villages the expenses of which were met by Government. As a beginning the Government had also provided funds from Local Funds for the maintenance of some bulls. It was proposed to work up a scheme for maintaining 500 bulls for distribution to villages. No appeal had so far been made to the public for funds as Government took upon themselves the whole responsibility. The policy advocated is the grading up of indigenous breeds.

Mr. Achar (*Mysore*) said that they kept a supply of premium bulls which were issued to the Panchayats on condition that all the scrub bulls in the vicinity would be castrated. The premium rate was about Rs. 75 per bull.

Mr. Marathe (*Baroda*) said that they had purchased and distributed bulls of the Kankrej and Gir breeds and had appointed a stockman for castration purposes.

Mr. Narayana Ayer (*Travancore*) said that in the Travancore State the response to His Excellency the Viceroy's appeal was not encouraging but

Government were fully alive to the necessity of keeping stud bulls and they had a system of grants ranging between Rs. 50 to Rs. 70 for the maintenance of bulls kept by agriculturists themselves.

Intensive grading work was also being done. The Red Sindhis thrived best in the State and the Government had recently purchased 5 Sindhi bulls recommended by Mr. Jerrom. The number of cows already served by these bulls is 300 and proper records of the progeny are maintained. Intensive grading of buffaloes had also been started. All this work was being carried out by the State itself.

Mr. Wazir (*Kashmir*) said that no funds had been collected from the public for cattle improvement work but the Government had, at their own expense, undertaken a scheme to introduce the Sindhi breed in the Kashmir valley and the Dhanni breed in the area adjoining the Punjab. A few villages had been selected in the first instance for the introduction of these breeds. Cows were registered and the scrub bulls were castrated. The Government bull was given to a big zemindar in a village who was given a monthly allowance of Rs. 10 for its maintenance. These zemindars were responsible for the registration and maintenance of the calves, the recording of all the calvings, registration of the issues, *i.e.*, whether male or female, the particular characteristics of the progeny, and any other records that the Government wished them to maintain. So far 16 such centres had been established in the Kashmir valley and 16 in the Jammu province. Government also proposed to purchase 30 bulls every year for a period of 5 years for breeding purposes and it was hoped that in course of time there would not be any necessity for purchasing stock from outside. The results of the Government cattle improvement scheme had been very encouraging and the zemindars were very satisfied and impressed with the improved progeny of the milch cattle.

Mr. Nighojkar (*Indore*) said that the Holkar Government has maintained a Breeding Farm of the Malvi Breed at Simrol, fourteen miles from Indore. Nine selected bulls from the Farm have been distributed upto this time. Some of the bulls are being looked after by individual cultivators and some by village Panchayats, who are given Rs. 75 per annum for the maintenance of each bull and they are responsible for maintaining a covering register and for keeping them in good condition. The bulls are being examined by the Veterinary Department from time to time and the registers are checked.

Major Sadik (*Patiala*) said that they were introducing the Hissar breed in the State. They were, however, experiencing considerable difficulty in procuring suitable animals. With all their efforts they had been able to purchase only 4 bulls so far. People were also contributing towards the cattle improvement fund and Government had also purchased cows from a Government farm so that they could distribute bulls bred at their own farms. So far Government had issued only concentrated food for the bulls while the public themselves were providing the green fodder. The bulls were under the Veterinary Department's supervision. If the villages did not maintain the Government bull properly, Government recalled the bull from that area.

Major Apte (*Gwalior*) said that they had distributed 51 bulls in six districts, which would be maintained by District Board, but no arrangements had yet been made for the registration of the progeny.

Mr. Mehra (*Bhopal*) said that the State had purchased 12 bulls for distribution and had also created a special fund for their maintenance.

Mr. Shah (*North-West Frontier Province*) stated that they had divided the Province in two areas, *viz.*, the Hills and the Plains. In the former they had the Sindhi breed and in the latter the Dhanni. So far Rs. 14,000 had been collected in response to His Excellency the Viceroy's appeal. Out of this, a sum of Rs. 5,000 had been collected from a very small area on the border of Afghanistan, *viz.*, the Kurram valley. Fifty bulls had been distributed in this area which was not bigger than a Tehsil. Another 100 bulls had been distributed in 6 districts of the Province. Including Chitral, Dir, and Swat agencies on the border of Russia, about 450 bulls had been distributed in the Province. Livestock Improvement Boards had been started which consisted of members keenly interested in cattle breeding. District Livestock Improvement Boards had also been established under the presidentship of an elected Chairman and a member elected by these District Boards represented them in the Provincial Livestock Board. The latter met in November last under the presidentship of His Excellency the Governor. The Government had subscribed Rs. 15,000 and another Rs. 15,000 had been subscribed by the District Boards for the maintenance of bulls. Before the introduction of this scheme the North-West Frontier Province used to import something like 5 to 6 lakhs worth of plough cattle from the Punjab. This import had now practically stopped due to the introduction of the subsidy scheme of cattle breeding. Cattle shows were held in villages, districts and tehsils where improved progeny along with the local bulls were collected so that the zemindars could see for themselves the benefits of the cattle improvement scheme. He informed the Board that on account of the breeding work in the North-West Frontier Province several *mandis* in the Punjab on the border of the North-West Frontier Province had been abandoned. They had got a separate fund for the maintenance of the breeding bulls.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that in Bengal there had been considerable difficulty in regard to the distribution of gift bulls and complaints were often received that the bulls provided were due to some difficulty or other, not suitable for the areas in which they were distributed. In accordance with Sir Arthur Olver's or the Imperial Council of Agricultural Research scheme the plan he advocated was that the bulls should be distributed to the zemindar on condition that if he refunded the full net price of the bull in three years the animal would become his own personal property. During these three years the zemindar had to see that the bull was well maintained and fully utilised as a stud bull, failing which it would be handed over to another zemindar and the first owner would lose whatever contribution he had made. At the end of this specified period the zemindar concerned would become the sole owner and could either use the bull for stud purposes or sell it. The advantage of the scheme is that the money originally spent is recouped and is available for further purchase and distribution of bulls. The ultimate result will be that an unlimited amount of cash for the provision of bulls would not be necessary. The details of this plan could be worked out easily and brought into practice by the State or Province accepting the suggestion. If considered necessary the period for repayment might be extended

but in that case the value of the animal when it became owner's property would be reduced. The bull would be about 7 years old by that time but it would be useful even then if it has been kept well. One of the conditions of this scheme would certainly be the registration of the cows served by this bull and the Government would arrange for the inspection of the progeny at the shows and also their registration. Registration should be done only after inspection, and when it was worth it.

He informed the Board that an extra item, arising out of the result of the last Cattle Show, had also been included in the agenda and would be discussed first by the Cattle-breeding Committee. The item referred to the number of grey cattle of less known breeds in India, the points of which were neither well known nor understood even by men who had spent their lives on cattle work in India. He would like, if the Committee agreed, a recommendation from the Board regarding the necessity for fixing the breed characteristics of these breeds, namely, the Nagori, Mowati, Malvi, Rath, etc. He suggested that a Committee composed of three officers of mature experience, *viz.*, Messrs. Henderson, Bruen and Gossip should be appointed for this purpose, funds for which would be a suitable charge on the Imperial Council of Agricultural Research, but this point could be further discussed after the Cattle-breeding Committee has recorded its views on this subject.

The Chairman said that the Research Council had decided to concentrate at the start on those milch breeds which were fully described in the Imperial Council of Agricultural Research bulletin No. 27. Mr. Kerr's suggestion was that the Council should now appoint a committee for laying down the breed characteristics of the grey cattle and this matter will be taken up first by the Cattle Breeding Committee.

The Board agreed with resolution No. 2 of the Cattle Conference on Subject No. 1. As regards the improvement of grasslands, the Chairman observed, that the Cattle Conference had accepted all the recommendations of the Board and a Central Fodder and Grazing Committee had been set up and had held two meetings. Two schemes for grassland improvement had been sanctioned by the Governing Body of the Council and would come in operation as soon as funds are available. Another scheme had been approved at the last meeting of the Advisory Board. Practically all the Provinces had now either set up Fodder Grazing Committees or made arrangements for this work to be done by some existing body. Some Provinces were financing important Schemes themselves. For example, the United Provinces had a Provincial Fodder and Grazing Committee with Forest, Irrigation, Revenue and Agricultural Officers serving on it and an important scheme of work had recently been described at the Central Fodder and Grazing Committee meeting. He then invited general comments from provincial representatives, on improvement of grassland.

Mr. Hurley (*Madras*) stated that a Standing Fodder and Grazing Committe had been created in Madras. In addition some district committees had also been formed.

Mr. Bruen (*Bombay*) said that since forwarding their last report they had made a good deal of progress. They had sanctioned schemes for the reclamation of land where with little expenditure good fodder could be grown.

Fodder and Grazing Committees had been formed in each district and he hoped to give a good account of them at the next meeting of the Board.

Explaining the conditions in Bengal *Mr. Kerr* (*Bengal—Officiating Animal Husbandry Commissioner*) said that the question of setting up a Fodder and Grazing Committee had been turned down in Bengal as the major portion of the Province suitable for grazing was dealt with by the Forest Department. They had formed a committee dealing particularly with the forest aspect of the question.

Mr. Richards (*United Provinces*) said that, in collaboration with the Lucknow University, they had started some research work on an enclosed area near Lucknow and a grant had been made to the University for furnishing information to the Agrostologist when he is appointed. Work, which had been going on under the Forest Department scheme in connection with fuel, fodder and grassland improvement, had progressed very satisfactorily and many zemindars were now willingly cooperating. The United Provinces Government have appointed a Committee to enquire into the utilisation and reclamation of *usar* lands. The terms of reference had been extended to include not merely alkali land but waste lands also. So far as cultivated fodders were concerned, both the Irrigation and the Agriculture Departments had been stimulating the development of berseem which was becoming popular and was likely in the near future to add very materially to the cultivated fodder available for local cattle and to increase the fertility of the soil for other purposes.

Mr. Azhar Ali (*Co-operative—nominated*) said that it was not his duty to point out what the Government was bound to do in this connection. His own experience was that it was very difficult to find grazing land either in the city or in suburbs. Considerable difficulty was experienced in regard to the cattle belonging to Lucknow dairies as the Cantonment authorites objected to their grazing in the Cantonment area. Similar difficulties were also experienced in Bombay and for this reason Cattle were let loose at night for grazing. This might constitute an offence but nobody looked to the facts and no places were allotted for grazing of cattle. In the United Provinces this problem would perhaps be solved by sending the dry cattle to the Terai. He suggested that the Punjab and Delhi Provinces might also send their cattle to the Terai for grazing. Further, he added that the Directors of Agriculture should discuss this subject and put up some proposals with a view to safeguard against the prevailing drought in several places. He was of the opinion that the question of grazing was more important than the provision of bulls.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that the points raised by Mr. Azhar Ali will be dealt with under the itemreferring to the salvage of dry cows from cities. This question arose as a result of keeping commercial dairies in big cities and it was necessary that arrangements should be made for the maintenance of cattle outside city limits under more natural conditions. The keeping of cattle in cities was insanitary to human population. He said that, as was pointed out by Mr. Azhar Ali, the arrangements for the supply of dairy products to large cities would involve considerable expenditure and would require the co-operation of the City Corporation of the Provincial Government and also of the Government of

India for concessions in regard to freight rates. The supply of milk to large cities was a very big subject and was more or less a commercial problem but was rather a small question when compared to the problem of the improvement of 300 million cattle of India.

The Chairman then asked other members to supplement the information about the action taken in their Provinces in regard to the establishment of Fodder and Grazing Committee.

Mr. Walker (*Punjab*) said that in the Punjab they had established a Fodder and Grazing Committee which was now busy tackling their own problems. He had nothing more to add to the information already provided.

Mr. Malik (*Bihar*) said that the matter was still under the consideration of the Bihar Government.

Mr. Takale (*Central Provinces*) said that the Central Provinces Government had not appointed a Fodder and Grazing Committee as recommended, but they were considering the problem and were awaiting information on various points. The Agricultural Department had made a survey of the fodder available from fodder crops and they came to the conclusion that for about six months the cattle could be fed on the grown up fodder. For the rest of the year the cattle had to depend on forest grazing. He added that the Forest Department were conducting research on the problem of improvement of the quality of grazing available in forests.

Rai Sahib Ghose (*Assam*) said that a Provincial Fodder and Grazing Committee had been set up in Assam and that they had distributed tufts of grass for growing in the compounds of Veterinary hospitals and in village areas throughout the Province.

Mr. Shah (*N.-W. F. P.*) said that a Provincial Fodder and Grazing Committee had been constituted in the North-West Frontier Province, but they had not so far met and would be meeting sometime next month. This body is the old Livestock Improvement Board to which an agricultural and a forest officer have been added.

Khan Sahib Ulvi (*Sind—nominated by Chairman*) said that no Fodder and Grazing Committee had so far been set up in Sind. Improvement in fodder and grazing was demonstrated to the public through the different district committees which existed in Sind and by demonstrations in zemindar's lands.

Rai Bahadur Chatterjee (*Orissa*) said that the question of establishing a Fodder and Grazing Committee in Orissa was under consideration, but in the meantime Veterinary Assistant Surgeons had been given a short course of training for cultivation of fodder grasses. Provision has also been made in each veterinary hospital for growing of fodder crops.

Mr. Achar (*Mysore*) said the large areas that had been set apart for the grazing of Amrit Mahal cattle had been released by the Government of Mysore for the use of private cattle breeders.

In regard to the need for increased personnel the Chairman said that the Board wanted to know whether the Provincial Governments had adopted the

scheme for the appointment of stockmen which was discussed at length at the last meeting of the Animal Husbandry Wing. He said that the information so far received would be recorded.

As regards the question of stockmen, *Mr. Bruen* (*Bombay*) said that in the Bombay Presidency the Provincial Government had not taken up the question of the appointment of stockmen, but additions were being made to his own staff.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that in Bengal the recommendation had been accepted and arrangements had been made for the training and employment of these men. There would be 10 stockmen under the livestock expert.

Mr. Jerrom (*Sind*) said that they had recently employed 8 stockmen and in course of time they expected to increase their number to 61.

Rai Bahadur Chatterjee (*Orissa*) said that in Orissa they were training 24 stockmen and 17 were at present under training at the veterinary hospitals. They were given veterinary training as well as agricultural training. This course was for nine months and in March they would be examined and the successful students would be employed either by Government or by local bodies. These stockmen will help the veterinary assistant surgeons in castration and propaganda work in villages.

Mr. Shah (*N.-W. F. P.*) said that the scale of pay proposed was very small and that in the North-West Frontier Province they had revised it to Rs. 25—1—35—2—55.

Rai Sahib Ghose (*Assam*) said that in Assam they had 43 Veterinary Field Assistants. Their work would be similar to that of the stockmen. The scale of pay had been fixed at Rs. 25 to Rs. 40.

In summarising the discussion the Chairman observed that the information furnished by the Provincial representatives will be duly recorded.

Rai Sahib S. C. Ghose was added to the Committee for Bacterial and Virus Diseases of Animals.

The meeting then adjourned till 2-30 P.M. on Tuesday, the 21st February 1939 to allow the various sub-committees to meet in the meantime.

S. BASU,
Secretary.

PROCEEDINGS—21st FEBRUARY, 1939.

The following were present :—

1. Sir BRYCE BURT—*Chairman.*
2. Mr. S. D. ACHAR.
3. Major M. S. APTE.
4. Mr. B. K. BADAMI.
5. Mr. H. S. BAWA.
6. Captain B. R. BINGLEY.
7. Rao Bahadur B. VISWANATH.
8. Mr. E. J. BRUEN.
9. Dr. W. BURNS.
10. Rai Bahadur N. CHATTERJEE.
11. Mr. S. R. CHADHA.
12. Mr. T. J. EGAN.
13. Mr. J. S. GAREWAL.
14. Rai Saheb S. C. GHOSE.
15. Dr. R. MACLAGAN GORRIE.
16. Mr. T. J. HURLEY.
17. Mr. K. R. NARAYANA IYER.
18. Mr. J. H. G. JERROM.
19. Mr. M. S. JUNG.
20. Mr. H. R. KAPUR.
21. Mr. K. P. R. KARTHA.
22. Mr. R. L. KAURA.
23. Mr. P. J. KERR.
24. Mr. W. KEVENTER.
25. Mr. W. M. KHAN.
26. Mr. D. N. KHURODY.
27. Mr. ZAL. R. KOTHAVALLA.
28. Mr. P. S. KUPPUSWAMY.
29. Dr. P. E. LANDER.
30. Mr. A. M. LIVINGSTONE.
31. Mr. G. J. MACDONALD.
32. Mr. M. R. MAHAJAN.
33. Mr. M. I. MALIK.
34. Mr. Y. N. MARATHE.

35. Dr. H. K. MEHRA.
36. Mr. R. N. NAIK.
37. Dr. V. V. NIGHOJKAR.
38. Dr. R. K. PAL.
39. Mr. P. G. PANDEY.
40. Rai Bahadur R. V. PILLAI.
41. Mr. R. K. RAM.
42. Mr. W. S. READ.
43. Mr. P. B. RICHARDS.
44. Major A. H. SADIK.
45. Mr. WYNNE SAYER.
46. Rai Bahadur R. L. SETHI.
47. Mr. S. M. A. SHAH.
48. Mr. H. B. SHAHI.
49. Mr. J. F. SHIRLAW.
50. Mr. BACHAN SINGH.
51. Rai BAJRANG BAHADUR SINGH.
52. Mr. BALBIR SINGH.
53. Mr. BALWANT SINGH.
54. Mr. BHIM SINGH GOVINDH SINGH.
55. Sardar Bahadur Sardar DATAR SINGH.
56. Mr. J. V. TAKALE.
57. Mr. RAMKRISHNA TAMPI.
58. Khan Sahib A. M. ULVI.
59. Rao Bahadur M. VAIDYANATHAN.
60. Mr. G. R. VISWANATHAN.
61. Captain U. W. F. WALKER.
62. Mr. JAMES N. WARNER.
63. Mr. V. L. WAZIR.

Mr. S. BASU—*Secretary.*

Visitors.

1. Mr. M. CRAWFORD.
2. Dr. N. D. KEHAR.

The meeting lasted from 2-30 P.M. to 5-30 P.M.

Practical methods for the improvement and control of grasslands (Subject No. 13).

Dr. Burns (Agricultural Commissioner) opened the discussion on this subject and referred to the note that he had submitted to the Board. He said that he wished to stress one or two points which had been mentioned in the note. The suggestions that he had made in his note were such as could be put into actual practice. The most important factor in the maintenance of grasslands was the necessity for reducing the number of grazing animals on the land. This fact was not fully appreciated either by cultivators or administrators.

Dr. Burns then referred to the lines of work which should be further pursued, *viz.*, demonstration of projects to compare uncontrolled grazing against grazing with a reasonable number of animals plus soil conservation measures. A good deal of useful work in this connection had been done in the United States of America in their Soil Conservation Programme. He then quoted the following passage from Professor Stapledon's presidential address at the International Grass Land Congress, 1937 :—

> " The first necessity is to classify our grasslands, and to understand their inter-relations, and then to work and to plan on the basis of clearly defined regions—natural regions ",

and emphasised that in India the agricultural workers were very much handicapped by having a long dry season. Special methods were necessary for a climate where one half of the year was favourable for grass development and the other half was dry.

He then referred to the paper by Mr. J. W. Rowland at the Grassland Conference held in 1937 regarding the application of plough to grass and stressed the point that in the drier parts of India, as in similar parts of Africa, the plough might do damage on grassland.

With reference to soil treatment, he said that the use of artificial manure was out of the question except as an experiment and that cow dung was very largely used as fuel. Advantage could be taken of what little cow dung was left and the system of rotational grazing ensured a concentration of dung and urine.

Dr. Burns explained the four methods he had proposed in his note for hypothetical conditions with different rainfalls and also where facilities for irrigation existed. At Mukteswar a very interesting experiment, by which wild grass *malsa* (*Pennisetum flacidum*) is ploughed in and oats are sown afterwards, is in progress. It showed the type of work which was possible. Then there were some wild legumes which required further experimentation. Sir Edward Cole of the Coleyana Estate had brought seeds of subterranean and wild white clovers from Australia and tried them on his farm in the Punjab. As these did not seed on his farm, experiments were conducted at Kashmir and Ootacamund and they were reported to be successful. The seeds produced at Ootacamund had now been sent to the Punjab for further trials.

Finally, Dr. Burns said that the question of grassland improvement must be looked at as a part of the whole system of land improvement which naturally led to soil conservation and the question of land use (*i.e.*, the allocation to each type of soil of the crop best suited to it). Dr. Gorrie's book ' The Use and

Misuse of land ' and the latest Yearbook of the United States of America Department of Agriculture entitled " Soils and Men " (1938) were two useful publications on the subject which should be read by every man interested in this line.

Mr. Read (*Punjab*) said that for purposes of enclosing a grazing land, cheapness was of prime importance. In his opinion *pise de terre* walls were the most suitable types of protection for enclosing a grassland. This type of construction was not unknown in India as work of this description was carried out at Etah Gaol in 1867-68 and it is understood that the walls are still standing. It was easily carried out and in a work at the Hissar Farm the man in charge of the work was getting annas ten per day and the rest of the labour was unskilled. The cost of a five feet high wall about one mile long was about 1,200 to 1,300 rupees. The cost included a brick covering provided on the top of the wall. As regards the possibility of an attack of white ants on such a construction, a fifty feet of wall built with practically no foundation about ten or eleven years ago at Hissar was not showing any sign of white ants although it has remained wholly exposed to the weather ever since its construction and the irrigation water often flowed right up to its base. He was of the opinion that so long as the top remained intact and was *pucca* it required no further protection and even plastering the sides was not necessary.

Dr. Gorrie (*Punjab—nominated by Chairman*) said that he could only speak about the conservation of grasslands from his own experience gained in the Punjab. The district in which he was working was Hoshiarpur Siwaliks which were the outlying range of hills separated from the main Himalayas by a series of valleys. Geologically the whole country was so unstable that any form of grazing would inevitably lead to disaster. The whole area was so unstable that merely by letting cattle graze for a couple of seasons, deep gullies would occur causing a ruination of the countryside. The only hope of making a better use of the land was to eliminate grazing altogether, and persuade the people to do the whole of grass cutting themselves and feed their cattle at the foot of the hills. This practice was already popular with the graziers. About the year 1900 a special Land Preservation Act, *i.e.*, the *Chos* Act was enacted in order to preserve the land. Originally the villagers were not willing to allow their lands to be closed to grazing but now they were happy to allow this to be done. They were able to sell off their cut grass to the tune of about 5,000 rupees a year. The experiment of the closure provided in the *Chos* Act was being followed up. During the last four years they had been doing propaganda and publicity amongst the people, the object being to obtain closure by agreement. Under the *Chos* Act, and incidentally under a section of the Forest Act, one could get a closure notified provided 2/3rds of the owners of the land applied to Government for a closure. The aim therefore has been to persuade a sufficient number of people to apply for closure and having got their application, to gazette a notification that such and such parts of the land would be closed for a definite period to grazing. There were two types of closure—(*i*) partial, by eliminating goats, and camels, and (*ii*) total, by elimination of all animals. They had found that partial closure over a period of 35 years did not help at all. Their aim, therefore, was really to teach people that they got the best value from their land by keeping the cattle out entirely and

cutting grass, using what they needed, and selling the rest to surrounding villages which had no grasslands. The cut grass from the Siwaliks has been selling so far afield as Patiala, Jullundur and in places across the Sutlej river. The grass from the Siwalik hills had also been of help to the eastern districts of the Punjab at the time of drought.

Mr. Richards (*United Provinces*) said that they had not yet gone far in the practical application of methods of improvement except in so far as a forest officer had been deputed under the Fodder and Grazing Committee's proposals for the purpose of inducing zemindars to plant up waste areas with trees which would provide fuel as well as loppings for fodder. Another experiment that they were carrying out was the enclosure of an area of about 200 acres of *usar* land part of which had been tractor ploughed and in which natural regeneration was being watched. The United Provinces Government had also very recently set up a new committee which had been instructed to inquire into the possibilities of reclamation and utilisation of all culturable and unculturable waste lands. The original terms of reference of this committee were for *usar* soil in the limited sense of alkali land but Government on the recommendation of the Committee had now extended the terms of reference to cover all types of uncultivated land. This committee was required to indicate the lines along which investigation should be conducted, and any methods which might be applied immediately to convert large tracts of unculturable waste land in the Province into arable, grazing, or forest areas. Very considerable work had previously been done by the Forest Department in the reclamation of ravine lands by simple enclosure and restricted grazing. Such areas on the banks of the Jumna and elsewhere have by this means not merely been protected against further gully erosion, but they now produce large quantities of fodder grasses: Government had under consideration the extension of closure of ravine lands to unrestricted grazing in order that these benefits should apply generally.

Khan Sahib Ulvi (*Sind—nominated*) said that in certain districts in Karachi where rain water was brought down from higher levels to plains, embankments were made by cultivators with the help of which useful grasses, *e.g.*, *andropogon* were being grown. These fields were not grazed at all till the grass was mature. On maturity, the fields were opened for hay-making in October. It was estimated that about 100 lbs. of hay per acre was obtained. After cutting the grass, the fields were let open for grazing. The stubble was kept alive throughout the year provided rain fell next year. In the irrigated areas they had got a system of *huri*, *i.e.*, babul plantation which provided fodder in the form of loppings during winter.

The chairman observed that the question of grazing improvement was very largely an administrative matter and consequently every member should try to keep his Government informed of the position. For the same reason this question was brought up from time to time in order to take note of what had been done and make further recommendations. He wished to emphasise in the first place the appalling damage caused to the soil by over-grazing in a country where most of the rainfall was concentrated in part of the year only. Secondly, the over-stocking of the so-called grazing lands was one of the major causes of

land erosion. Now that more interest was being shown in waste land reclamation, it was important to remember that such ' culturable waste ' might often be more profitably converted into properly managed grassland than into arable land. The schemes that had come up before the Central Fodder and Grazing Committee definitely showed that this aspect was already receiving attention in at least two Provinces. Another point, which arose out of Mr. Ulvi's remarks, was that whenever a new irrigation scheme was contemplated, the question of irrigated grass lands ought to receive due attention.

Dr. Burns (*Agricultural Commissioner*) said that those who were working on the problem of grassland improvement could get ideas from the work that had been done elsewhere and they should keep in close touch with fresh developments through the medium of such journals, as :—

1. Herbage Abstracts.
2. Herbage Review.
3. Soil Conservation.

In summing up the discussion he moved the following resolution :—

> " The Board notes with satisfaction the various efforts that are being made in Provinces and States towards the improvement of grasslands and recommends that these should be extended and intensified and linked up with all other movements towards soil conservation and planning for better land use ".

Mr. Bruen (*Bombay*) said that various experiments on these proposals were already being carried out in the Bombay Presidency. One Deputy Director had been given an area of 40 acres of grassland, half of which was to be protected and half unprotected, in order to show to the people the way in which grasslands could be managed and with the object of eventually handing over the management of all grasslands to Panchayats. With these remarks he seconded the resolution.

Mr. Richards (*United Provinces*) proposed the following addition to the resolution :—

> " Further that Local Governments be invited to consider the desirability of taking legislative powers, where necessary, for enforcing the proper utilization of grazing areas and waste lands capable of producing fodder or fuel."

This was seconded by Captain Walker and the following amended resolution was unanimously passed by the Board :—

> " The Board notes with satisfaction the various efforts that are being made in Provinces and States towards the improvement of grasslands and recommends that these should be extended and intensified and linked up with all other movements towards soil conservation and planning for better land use. Further, that Local Governments be invited to consider the desirability of taking legislative powers, where necessary, for enforcing the proper utilization of grazing areas and waste lands capable of producing fodder or fuel."

Need for investigation of the Proteins of Indian Grasses. (*Supplementary Note on Subject No. 13.*)

Rao Bahadur Viswanath (*Imperial Agricultural Research Institute*) introduced the note submitted by the University Bio-chemical Laboratory, Madras, and observed that a case had been put up for the investigation of the Amino-acid content of pasture grasses. He was of the opinion, however, that what they exactly wanted to know at present was the ratios of the several mineral constituents, particularly phosphates, in most of these fodders. He felt that within the past 30 years investigators had been too partial to the problem of nitrogen. Now when the position in regard to nitrogen was known and the methods for obtaining it either by artificial or by biological means, were well established they had reached a stage when special attention should be paid to the requirements of phosphate. He recommended, therefore, that before any further work could be undertaken on the amino-acid content of some of the grasses, investigation should be carried out on the phosphate content and the nature of the phosphate compounds in the grasses.

Dr. Lander (*Punjab*) said that detailed investigation of the nature of proteins was a highly academic problem and he agreed with the Rao Bahadur that the problem on which they ought to concentrate at present was the mineral balance of grasses along with the total protein content. He thought that a good Indian grass, *e.g.*, *Dub* was highly rich in protein and most of the other ordinary grasses were adequately rich if they were cut at the right stage. He suggested, therefore, that they should work out the calcium-phosphorus ratio and that should be taken into account in conjunction with the total protein content, for, if an animal was fed with an adequate amount of fresh young grass cut at the right stage which showed a correct calcium-phosphorus ratio, they could be pretty sure that it was going to be a satisfactory ration.

The Chairman observed that it was necessary to distinguish between English and Indian conditions in discussing the importance of research of this class. In England special attention was now being devoted to the utilisation of high quality grasses as a substitute for purchased concentrated foods. In India the immediate problem was a general improvement on the grass and fodder supply.

The Board agreed that the investigation was purely of an academic nature and there was no need to pass any resolution. The paper was recorded.

Note on fodder production with special reference to mixed farming at the Government Farm, Bichpuri [*Subject No. 14 (a)*].

Mr. M. S. Jung (*United Provinces*) said that there was nothing new in the practice of mixed farming, as it was already being adopted in most Provinces in India. It was adopted in the United Provinces as an aid to the introduction of good milch breeds in the rural areas. He supported his contention by quoting paragraph 2, page 59 of Dr. Wright's report. In the statement No. XII appended to the note a gross profit of Rs. 2,168 was anticipated under mixed farming as compared with 1,442 obtained before without mixed farming. Mixed farming would not only yield more profit but would also give an increased milk supply. It could be more successfully practised in irrigated tracts or where irrigation facilities existed. This system was being introduced in the

Sarda Circle in the United Provinces where the cultivation of leguminous crops was being encouraged. A few non-officials, *e.g.*, Raja Sahib of Bhadri in the Partabgarh District, were also introducing this system on their lands.

Mr. Wynne Sayer (*Imperial Agricultural Research Institute*) said that in most of the irrigated tracts mixed farming was going to be the salvation of the land. He instanced a case of an area (of blowing sand) taken over at Pusa on the edge of the river which grew small amount of grass and dried right off in March. It was used as an exercise ground for cattle. It was brought under pump irrigation and for the purpose of experiment it was exactly the same as flow irrigation. For some 8 years the Agricultural Institute ran a rotation on it consisting of maize and *meth Trigonella Faenum-graecum* (one of the leguminous fodders) in the hot weather and berseem in the cold weather. A Sahiwal herd and bullocks were kept on this green fodder and not a penny was spent on manure. Just before the earthquake the final stage of the problem had been reached and sugarcane was put on one-third of the area without manure, the crop yielding 700 to 800 maunds an acre and it was quite possible to maintain the high fertility of the land which it had reached. During the last 24 years he had watched this problem and, in his opinion, the main fundamental principles of farming had been very sadly neglected because there were no immediate results to be seen. It was not like bringing out a new crop which would show high yields. A land in good harvest was the result good farming and hard work and not the result of any botanical discovery. Improved seed alone could not show good results on poor land. In the course of his tours he saw wheat experiments being carried out for improving yields by growing improved seeds only and no attention was being paid to the improvement of land. This was not the right procedure. Improvement of land was also an important consideration and the introduction of cattle on the land solved most of the crop problems effectively. The more the cattle were worked in as part of an economic farm, the better would be return on crops. Another thing which he would point out was that there was tremendous increase in plant diseases all over due to less resistance on the part of the new strains and exhaustion of land in some of its essential constituents. Mixed farming would considerably help in removing this trouble by maintaining the fertility of the land. Again cattle breeding also becomes much simpler by mixed farming. In this way the system can be helpful in many directions if practised along right lines.

Khan Sahib Ulvi (*Sind—nominated by Chairman*) said that there is perennial irrigation in Sind. When the Barrage opened in 1932, the cultivators put huge areas under cotton and wheat resulting in shortage of fodder. The Agriculture Department, therefore, carried out experiments with mixed farming in order to provide fodder for cattle and allowed only a limited area to be put under commercial crops. Experiments on mixed farming at Shahad Kot farm gave an yield of 15 to 20 maunds seed cotton to the acre. Sufficient area could be released for fodder growing. He had introduced mixed farming not only for cotton and other staple crops but also for vegetable gardens and fruits. At Mirpur Khas some plots were put under fodder and fruit, and now the farm was producing a good crop of mangoes and oranges. These trees would not give enough yield before but by putting in cattle, their yield has increased. In between these fruit trees which are kept about 30 feet apart, they were having

cover crops and maintaining milch cattle according to the carrying capacity of the farm. These were serving as good demonstrations to small cultivators. There is another farm at Sakrand which was being similarly treated. At Shadapur a nucleus herd of 40—50 animals on an area of about 200 acres was being put. The area would not only provide cattle with fodder but would produce main commercial crops like cotton and wheat. At Dokri it was proposed to have a herd of buffaloes and rice and other crops were being tried. They were also considering the question of rearing sheep for wool production. Several zamindars in Sind had sheep on their cotton fields. These were allowed to wander about or tethered in fields whereby the land was manured and the out-turns were good. The Sind Zemindar had taken to mixed farming.

Mr. Livingstone (*Agricultural Marketing Adviser*) said that in experiments in mixed farming a profit and loss account should be shown in order to bring out the results more clearly. He referred to one or two items in statement XII and said that Rs. 240 shown as value of manure obtained from dairy herd, should not have been credited on the income side unless the manure had been actually sold. He then referred to the value of 16 calves raised during a year when they had only ten she-buffaloes and was of the opinion that the values shown against the calves could not have been realised.

Mr. Jung (*United Provinces*), in reply, said that the number of calves shown was high, because they had a large number of buffaloes on the farm when the experiment was started and that thereafter they had reduced the number and fixed it at 16. As regards the price of the calves, they were based on actual facts and they were the prices paid by the Government. He said that he could realise Rs. 20 for a calf six months old and Rs. 50 for a year old calf.

Mr. Richards (*United Provinces*) said that he entirely agreed with the view expressed by Mr. Livingstone in regard to the maintenance of accurate records showing precisely what had been the outcome of the experiment. This experiment had only just been started and it was only now begun on the lines of a satisfactory layout. Mr. Jung had prepared this note at his request and he had attempted to show what might reasonably be expected from mixed farming. In his estimate, Mr. Jung had actually erred on the side of conservatism rather than liberality. The crop out-turn under higher manuring possible under mixed farming had not been estimated ; the yields having been taken on the basis of the normal out-turn of the previous years. The farm expected to have an additional 5,000 maunds of manure annually and as the area under leguminous crops had been increased from 35 to 45 acres a large increase in out-turn from the saleable crops was expected. This should aggregate much more than the sale value of the manure. Mr. Livingstone's objection could only be valid if, in addition to sale value of manure, they had shown an estimated increase of 25% in the cash returns expected from the saleable crops. The experiment had only recently begun and the note was intended as a record of the present position and not as a demonstration of the possibilities under mixed farming. Detailed accounts would be maintained and the actual data would be available at the next meeting of the Animal Husbandry Wing which would show what had been the actual results of the experiment.

Dr. Burns (*Agricultural Commissioner*) said that it would be helpful if the basis of calculation of the average cost of cultivation per acre could be given in any note that might be submitted hereafter.

The Chairman said that it would be useful if the items which went to make up the cost of cultivation per acre were given. The question had first been brought into prominence at a meeting of the Cattle Breeding Committee in the course of discussion on some of Dr. Wright's recommendations. The idea underlying the experiment was to ascertain and demonstrate how the cash income from a farm could be increased simultaneously with a rising standard of fertility. Mr. Parr had then explained to the Committee the lines on which he was working at the Bichpuri Farm. Mr. Parr's view was that the same amount of cotton, wheat and sugarcane might be obtained from a smaller area by keeping livestock, using the extra manure on the farm and gradually increasing the sale of milk. In other words, the idea was to sell more animal products off the land and not only vegetable products. The Advisory Board of the Council commended the experimental work for the consideration of the Governing Body. Last July, the Governing Body, when considering developmental activities, agreed that the Research Council should give small grants to aid well-planned experiments on these lines in the provinces. The grant from the Council was intended to help the provinces in connection with the expenses of additional supervision which would be required for obtaining accurate records. As the Council believed that the question of mixed farming was of fundamental importance, the Governing Body were prepared to sanction small grants for well-planned experiments in provinces.

Mr. Bruen (*Bombay*) said that the Government of Bombay had accepted the recommendation of the Council and were converting the demonstration farms in the province on the lines recommended by the Council. It was expected to establish two farms in each district. The farms that were having cattle would have cattle and those that were having sheep would have sheep.

Mr. Sayer (*Imperial Agricultural Research Institute*) said that these experiments should be financed for a long term and that the term for which the grant would be sanctioned should be stated. He was of the opinion that the longer the duration of experiments, the better would be the result.

The Chairman said that any grants from the Council were usually for a period of five years and at the end of that period it was considered whether the scheme should be extended or not.

The following resolution was passed :—

> " The Board emphasises the importance of well-planned experiment in mixed farming and notes with satisfaction that the Governing Body of the Research Council is prepared to give small grants to assist such experiments ".

Tree fodder with special reference to flooded areas [*Subject No. 14(b)*].

Rai Bahadur Chatterjee (*Orissa*) said that the note on the above subject was prepared by the Deputy Director of Agriculture. The position in Orissa was that during the monsoon there was scarcity of fodder in flooded areas and therefore they had to study whether fodder trees could be cultivated profitably.

Dr. Burns (*Agricultural Commissioner*) said that his note on the subject was largely a list. He referred to the Bombay Department of Agriculture Bulletin No. 130 of 1926, by Mr. M. S. Tuggerse which contained very useful information on the planting of fodder trees. The planting of trees brought the question of the use of land either for fuel or fodder. He advocated that fodder tree planting should be undertaken on every holding. It would be difficult to protect fodder trees in their young stages, but, to protect them, a hedge of spineless cactus which was immune from the attack of the insect Cochineal should be erected.

Dr. Gorrie (*Punjab—nominated by Chairman*) said that the main point in the note submitted by the Government of Orissa was to find out what trees could be grown in flooded land. This constituted a peculiar and rather difficult problem from tree growers' point of view, because there were but few species of trees which were fundamentally suited to growing on flooded lands. The amount of flooding and the seasonal periodicity of flooding was extraordinarily important, *e.g.*, the trees that were able to grow on flooded lands were mostly leguminous ones—*Delbergia sissoo* and two or three of the *Acacias*. Practically none of them would survive if they were flooded in the seedling stage for any long period of time so that if it was intended to grow them on a large scale and if the flooding was seasonal and the water was appreciably deep, it would be necessary to build some sort of bunds on which young trees could survive the flooding stage. There were good many species which could stand almost any amount of flooding but none of them were exempt from this difficulty in the seedling stage. It was a very technical problem and rather a very difficult thing to generalise. He advised those interested in the development of tree fodders to get in touch with the local forest officer to see what experience he could provide. It was a most dangerous thing to generalise about this. One species would change its life and respond in entirely different fashion to a given amount of flooding in different areas. For instance, in the irrigated plantations in certain arid zones in the Punjab, a certain amount of irrigation was essential for the plantation to thrive but irrigation water was less than half its worth in terms of depth of inches of rainfall than rainfall itself. In Multan district, rainfall varies from 3 inches to 12 inches. If that 12 inches of rain came in fairly good showers, it was worth at least about 3 feet delta of water given in terms of irrigation. There was, therefore, a very big difference between the value of water given as irrigation and received as rainfall. This point must be kept in mind when discussing the growing of fodder trees in arid zones. Referring to the observation in the notes submitted by the Sylviculturist, Forest Research Institute, Dehra Dun, that " a large percentage of fodder lopped is invariably left untouched by the animals which, while still hungry, will turn from a good fodder species and eat leaves of other species not generally considered good fodder. The reason for this is not fully understood unless it be that leaves must be absolutely fresh when fed to the animals ", Dr. Gorrie said that that again was a dangerous generalisation to make. In many districts of the Punjab, they continued to feed leaves to cattle unless they were very dry. The dry leaves are fed mixed up with Bhoosa for a number of months and when the next ploughing season comes, the remaining dry leaves are put in the fields as manure so that there was no waste. The whole subject bristled with difficulties and he, therefore, advised those who were interested in this

vital subject from the point of supplementing the supply of fodder to get in touch with people who really knew the district, and the technical difficulties of growing local species.

Mr. Richards (*United Provinces*) said that although a great deal had been heard about the management of grassland for the production of maximum amount of fodder from an area, nothing had been heard about the management of trees grown for fodder in order to produce the maximum amount of nourishment from that source. Unless work is done in this direction to serve as a guide all the work in progress in various areas including the United Provinces might be wasted. It was essential that they should know how to treat their trees of different varieties in order to get the maximum amount of loppings from them for fodder purposes. He complained that if they asked for such information from a forest officer, he said that this was related to gardening and when they asked a gardener, he said that this pertained to forestry.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that in Bengal, several areas remained under water about 3 to 4 feet deep and they wanted some plantations which would remain above flood level for feeding the animals during three to four months of heavy rainfall. They had the same complaint as Mr. Richards had about getting the necessary information about suitable fodder trees. In Bengal, they found that banana trees could stand floods. When no other green fodder was available, the elephants could live upon leaves of banana trees. He desired to know whether it was worth while spending on wild banana plantations for obtaining a supply of green fodder in the rainy season. Mr. Kerr also desired to know the type of water plants roughage, etc., which buffaloes would readily eat and thrive on. During flood times, animals which did not get anything else to eat could exist on water hyacinth. He wished to have some guidance from the officers present in the Board as to how they might proceed to get the necessary information sought in paper No. 14(*b*). Certain trees could, no doubt, grow in marshy areas, which though not first class fodders were at least better than starvation.

Mr. Read (*Punjab*) said that at the Hissar farm they were doing silaging of tree leaves. The leaves of *sheesham* (Dilbergia sissoo) were readily eaten by cattle. He, however, pointed out that the cost of removing leaves from twigs was considerable. This was a matter for the agricultural engineers.

Khan Sahib Ulvi (*Sind—nominated by Chairman*) said that in Sind, they grew *Babool* (*Acacia sp.*) plantation in the fields. They would irrigate land, and drill in *juar* or *bajri* and Babool trees, the latter 30 or 40 feet apart. The *babool* trees were cut in winter, the leaves were dried and mixed with rice bran and given to milch cattle or dry cows as concentrated food along with rice straw as roughage. Babool tree was, therefore, most important in Sind.

Dr. Burns (*Agricultural Commissioner*) said that very little information was available on the subject. It was, therefore, most important that any information which was already available should be compiled and sent up for publication in the Council's journal " Agriculture and Livestock in India ".

PROCEEDINGS—22ND FEBRUARY, 1939.

The following were present :—

1. Sir BRYCE BURT—*Chairman*.
2. Mr. S. D. ACHAR.
3. Major M. S. APTE.
4. Mr. B. K. BADAMI.
5. Mr. H. S. BAWA.
6. Captain B. R. BINGLEY.
7. Rao Bahadur B. VISWANATH.
8. Lieutenant-Colonel W. H. BLOOD.
9. Mr. E. J. BRUEN.
10. Dr. W. BURNS.
11. Rai Bahadur N. CHATTERJEE.
12. Mr. S. R. CHADHA.
13. Mr. T. J. EGAN.
14. Mr. J. S. GAREWAL.
15. Rai Saheb S. C. GHOSE.
16. Dr. R. MACLAGAN GORRIE.
17. Mr. T. J. HURLEY.
18. Mr. K. R. NARAYANA IYER.
19. Mr. J. H. G. JERROM.
20. Mr. M. S. JUNG.
21. Mr. H. R. KAPUR.
22. Mr. K. P. R. KARTHA.
23. Mr. R. L. KAURA.
24. Mr. P. J. KERR.
25. Mr. W. KEVENTER.
26. Mr. W. M. KHAN.
27. Mr. D. N. KHURODY.
28. Mr. ZAL. R. KOTHAVALLA.
29. Mr. P. S. KUPPUSWAMY.
30. Dr. P. E. LANDER.
31. Mr. A. M. LIVINGSTONE.
32. Mr. G. J. MACDONALD.
33. Mr. M. R. MAHAJAN.
34. Mr. M. I. MALIK.
35. Mr. J. N. MANKAR.

36. Mr. Y. N. MARATHE.
37. Dr. H. K. MEHRA.
38. Mr. R. N. NAIK.
39. Babu BIRBAR NARAYAN CHANDRA DHIR NARENDRA of Madhupur-Garh.
40. Dr. V. V. NIGHOJKAR.
41. Dr. R. K. PAL.
42. Mr. P. G. PANDEY.
43. Rao Bahadur R. V. PILLAI.
44. Mr. R. K. RAM.
45. Dr. H. N. RAY.
46. Mr. P. B. RICHARDS.
47. Major A. H. SADIK.
48. Mr. WYNNE SAYER.
49. Mr. S. K. SEN.
50. Rai Bahadur R. L. SETHI.
51. Mr. S. M. A. SHAH.
52. Mr. H. B. SHAHI.
53. Mr. J. F. SHIRLAW.
54. Mr. BACHAN SINGH.
55. Rai BAJRANG BAHADUR SINGH.
56. Mr. BALBIR SINGH.
57. Mr. BALWANT SINGH.
58. Mr. BHIM SINGH GOVIND SINGH.
59. Sardar Bahadur Sardar DATAR SINGH.
60. Mr. J. V. TAKALE.
61. Mr. RAMKRISHNA TAMPI.
62. Khan Sahib A. M. ULVI.
63. Rao Bahadur M. VAIDYANATHAN.
64. Mr. Y. R. VISWANATHAN.
65. Captain U. W. F. WALKER.
66. Mr. JAMES N. WARNER.
67. Mr. V. L. WAZIR.

Mr. S. BASU—*Secretary.*

Visitors.

1. Mr. M. CRAWFORD.
2. Dr. N. D. KEHAR.

The meeting lasted from 10 A.M. to 5 P.M.

The necessity for the establishment of Provincial Livestock Associations and Cattle Improvement Funds (Subject No. 15 of the agenda).

While asking Mr. Kerr to open the discussion on this subject, the Chairman invited the attention of the members to the information summarised in the paper circulated on subject No. 12.

In initiating the discussion *Mr. Kerr (Bengal—Offg. Animal Husbandry Commissioner)* said that he put up a short note with the object of bringing the necessity for the establishment of provincial Livestock Associations and Cattle Improvement Fund before the Animal Husbandry Wing lest it should be forgotten for another two years. It was an important matter which we should keep on urging in the Provinces in order to keep it alive. The main object of the associations was to maintain the interest created by His Excellency the Viceroy's gift bull scheme and to watch over the care and maintenance of the bulls, the castration of undesirable bulls, the recording and registration of cows served by them, the registration of their progeny and selection from amongst the progeny of suitable animals for further distribution as improved bulls and cows. He pointed out that this would mean extensive work and if it is to be carried out successfully, non-official agencies and breeders should also take due interest in this work and should not depend on Government to carry it out indefinitely. He added that some Governments might be in favour of this work and some may not be and, therefore, public opinion should be stimulated with a view to ensure continuity. He cited the example of work done in England by private enterprise. He briefly indicated the lines of work in India and said that cattle uplift associations should be established in each Province and after they had developed, better types of breeding associations and societies should be started. Provincial Associations should be started in the first instance with contributions from persons interested in the welfare of livestock and with a small grant-in-aid from Government. These provincial associations should have branches in each district and sub-divisions. He then cited the opportunity afforded in Bengal for the salvage of dry cows from Calcutta which could be looked after by these associations. Provincial Governments would be able to help these associations by a small grant in aid and by the help of their technical experts in the Veterinary, Animal Husbandry and Agricultural Departments. Mr. Kerr concluded by saying that he had purposely outlined the scheme, as he was not familiar with conditions prevailing in other provinces and before a definite scheme could be drawn up he desired to have the views of the other members of the Board when a final recommendation might be framed and circulated to the Provinces.

The Chairman said that, as rightly pointed out by Mr. Kerr, no appreciable progress will be made if the question of improvement of cattle is left entirely to Government. It was, therefore, necessary to enlist the support of non-officials.

Mr. Hurley (Madras) said that so far nothing had been done for the improvement of cattle by the establishment of associations. The whole question was under the consideration of the Local Government and they were thinking of starting a livestock improvement association and the establishment of a livestock improvement fund. In addition, they were contemplating to start breeding societies for the Ongole and Kangyam breeds.

Mr. Bruen (*Bombay*) said that sometime ago there was a proposal to start a Rural Development Department but he did not know what the position was at present. As regards the provincial associations, he said that he had a very sad experience. Some years ago an association was started and a meeting was held under the Chairmanship of Sir Leslie Wilson, the then Governor of Bombay, which was attended by about three to four thousand people from all over the Province. It then looked as though the association would have financial support both from private persons and from Government. After about two years, however, it was found that no money could be collected and the only recommendation the Committee put up to Government was that they wanted more grazing land. As Government were not able to do very much in this matter, the association fizzled out. Mr. Bruen felt that the only way to achieve success was to form local societies or regional associations as it was very difficult for a central association to deal with matters connected with the various parts of the province. He further observed that the villagers were reluctant to take interest in anything which involved them in some expenditure and which did not appear to them as profitable. He was, therefore, of the opinion that these local societies should be formed with a view to help the villager.

Mr. Bruen then referred to the following statement in Mr. Kerr's note on the subject :—

> " It is through the work of these associations that the herds of cattle which started with an annual yield of say 2,000 lbs. milk a century ago, are now yielding ten times as much."

He considered this statement rather misleading. Mr. Kerr said that what he meant was that the yield had gone upto 10,000 lbs. The statement was amended accordingly.

The Chairman enquired as to what scope there was for tapping private sources to get financial assistance for cattle improvement.

Dr. Burns (*Agricultural Commissioner*) said that it was difficult to anticipate into which channels private charity would flow.

Mr. Sayer (*Imperial Agricultural Research Institute*) said that he had seen at the Imperial Delhi Horse Show that a large number of non-officials were interested in it but he complained that cattle breeding had been very much neglected. If the interest of private zemindars and non-officials was aroused in cattle breeding by holding similar shows, it was hoped that they would extend financial support to cattle breeding. He referred to the valuable work of the Pattagar of Palayakoti and added that this excellent example could be emulated by private breeders all over the country.

Mr. Bruen (*Bombay*) said that the public could be induced to extend financial support to such schemes which would be beneficial to the particular territory in which they resided. For instance it would not be possible to collect money from Gujerat and Ahmedabad districts and spend it in Dharwar district.

The Chairman said that what Mr. Bruen really meant was that in the Bombay Presidency regional societies or associations were the immediate necessity and in view of the previous failure of the provincial associations, no attention be paid at present to the establishing of such associations.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) then explained the working of the provincial livestock association and cattle improvement fund in Bengal.

Mr. Richards (*United Provinces*) said that he was in agreement with what Mr. Bruen had said about the unreliability of private enterprise.

They had only one important indigenous breed the Kherigarh which was a draft breed confined to a small area. Elsewhere their cattle improvement policy necessitated the distribution of pure stock for the purpose of grading up. Two years ago they had proposed to develop an organisation similar to that proposed by the Cattle Conference. This recommendation had already gone to Government before the Cattle Conference started. At that time it was intended that they should have a series of district, divisional, and provincial cattle welfare organisations. It was hoped that there would be substantial contributions from the local zamindars to the district funds. The Divisional cattle committees under the Commissioners would link up the work of the district organisations, and members nominated on the district and divisional committees were to form the Provincial Animal Welfare Committee. The Provincial Committee would receive subventions from Government which it would allocate to the district organisations according to their needs. The political position had since changed and it was possible that many of the sources from which private contributions might have been expected would have dried up. The Government of the United Provinces realised that dependence had to be placed mainly upon Provincial funds, and that success was largely dependent upon the effectiveness of the better living and like societies and the District Rural Development Associations which they were hoping to constitute under the Rural Development organisation and which would rely for guidance upon the Agricultural and Veterinary staff. This was the policy of the Government of the United Provinces so far as the actual working in the village and in the district was concerned. Instead of a provincial animal improvement committee, the United Provinces Government had now constituted a Provincial Board of Agriculture and Animal Husbandry which would be presided over by the Honourable Minister. This board would advise Government in all matters connected both with agriculture and animal husbandry. The supervision and guiding of the work would rest with the district rural development associations and better living societies. In addition, there were various other activities to carry on the work connected with the cattle improvement work within a village. It was the responsibility of the departmental staffs to direct the work of these societies and pending the formation of such societies in the villages, the departmental officers would be directly responsible for cattle development and welfare work. Some 250 stockmen were being provided who would be in the main the advisers of the rural development organisations and better living societies. It was anticipated that as villagers realised the immense value which accrued to them from the stationing of improved animals they would be prepared to make contributions for maintaining the bulls. At present a sum of Rs. 22 was charged by Government on account of the services of a bull during its life time. That money came back into the pool for the purchase of more stock. The animal remained the property of Government. When the animal was withdrawn ultimately, it was sold for about 15 rupees and that sum was

also credited to the bull purchase fund so that they were able to recover practically half of the original cost of the bull. In cases where a person was not able to pay Rs. 22 in one instalment, the sum was levied by way of taccavi loans spread over a period of years.

Mr. Richards finally said that if the bull died before giving its useful term of service or proved to be useless it was replaced free of charge.

Mr. Garewal (*Punjab*) said that in the Punjab no difficulty was felt in regard to funds and the work of cattle-breeding Associations was being carried on by the District Boards.

Mr. Malik (*Bihar*) said that there was a proposal for forming a Provincial Association and District Associations had already been formed, but they were unable to do any work because the Government had not yet decided their cattle-breeding Policy.

Mr. Takale (*Central Provinces*) said that a Provincial Livestock Improvement Association had been formed but the work so far done was not very encouraging ; it was, however, hoped that in course of time this Association would be functioning well. A special fund had also been collected from which no expenses were incurred so far ; those for the purchase of bulls having been met out of the Government of India Grant and donations. Finally he said that the Central Provinces Government was going to open a Sheep Breeding Farm and a Cattle-breeding Farm with 200 Malvi cows and it was hoped to issue 80 to 100 bulls per year for distribution.

Rai Sahib S. C. Ghose (*Assam*) said that a Provincial Livestock Improvement Association had been formed in Assam, under which there were several District and Sub-divisional Associations. Both officials and public had joined these and substantial support was being given by the District Boards. Bulls were distributed through these Associations in selected areas after castrating the scrub bulls there.

Khan Sahib S. M. A. Shah (*N.-W. F. P.*) said that a Provincial Livestock Improvement Board had been constituted in the North-West Frontier Province with His Excellency the Governor as the President and the Hon'ble Minister in charge of Industries Department as the Vice-President. A fund of Rs. 14,500 had been collected as a result of His Excellency the Viceroy's appeal. This fund had been made permanent by a further annual contribution of Rs. 15,000 by the local Government and Rs. 15,000 by the District Boards. One hundred and seventeen bulls had been purchased out of this fund and distributed in the six districts ; 50 bulls had been located in the Kurram Valley and 9 in the Swat agency. A subsidy allowance of Rs. 8 per mensem was paid for each bull distributed out of this fund. On receiving applications from the different localities a survey was made to examine the suitability of the areas for breeding work. After selecting the places bulls were supplied on the condition that the allottee would contribute Rs. 50 towards the cost of the bull, to be paid in instalments of Rs. 8 per mensem. He was also expected to maintain two registers ; one showing the number and description of cows which were covered and the second for similar description of the progeny. At present there were altogether 450 bulls working in the province which were periodically inspected by the Veterinary Assistant in the Ilaqa once a month and the Superintendent

once a year. In this way a regular record was maintained of practically every cow that was bred under this subsidy scheme. The results achieved were very encouraging as prior to the introduction of the scheme, plough cattle worth 5 to 6 lakhs were imported from the adjoining districts of the Punjab, *viz.*, Cambellpur, Mianwali, etc. This, he was glad to say, had stopped and instead of importing they were actually exporting some animals now. This in itself was a convincing proof of the success of the scheme. Finally he said that during the November meeting of the North-West Frontier Provincial Association the question arose as to how to enhance these activities and how to provide funds. Some of the suggestions made were (*i*) to levy a small cess on the sale of cattle in Fairs in the province ; (*ii*) a small cess on the export of hides and skins, goat hair, wool, etc., from the North-West Frontier Province. These were still under consideration.

In regard to Sind, *Khan Sahib A. M. Ulvi* (*Sind*) said that Government were going to convene a Cattle Conference very shortly after which the question of the formation of Cattle Breeding Association would be taken up.

Rai Bahadur Chatterjee (*Orissa*) said that a Provincial Cattle Breeding Assocaition was started in 1936 with His Excellency the Governor as Patron and both officials and private individual interested in cattle breeding as members. The entire work in the province was controlled by this Association and it was not considered necessary at present to start district or Sub-divisional cattle-breeding Associations. The districts were well represented in the provincial association and the work was carried out mainly by the Veterinary Department. The Association had already opened several centres throughout the province with approved bulls maintained chiefly by the Association. The cows served by these bulls and their progeny were recorded in the registers maintained for this purpose. A pure herd of Hariana breed is also being established for which many Hariana cows were purchased. Two pedigree bulls were also purchased for the purpose from the Government Cattle Farm, Hissar. Building up of pedigree Hariana herds is being taken up in some jails also. Approved bulls are being supplied free to selected villagers who are required to maintain them properly, but in certain cases the cost of maintenance is also borne by the Association. These bulls are under the supervision of the Veterinary Assistant Surgeons, who would be helped by trained stockmen when they are appointed. The Veterinary Assistant Surgeons are responsible for seeing that the bulls are maintained properly. The description of cows served and their progeny is recorded.

Mr. Mankar (*Bombay*) said that at the instance of Sir Leslie Wilson, Governor of Bombay, a cattle improvement and dairy farming association was started in the Bombay Presidency in 1929 by the efforts of Mr. Bruen. Attempt was made to start District Associations and one was established at Poona. Village Associations were also started and propaganda was carried out with the help of a touring car and the objects of the association were explained to the cultivators. Village committees were formed for helping in the maintenance of stud bulls and improvement of cattle. Later on the co-operation of the Gowshalas was secured. The villagers wanted monetary help from Government for cattle-improvement work, but the latter was unable to comply with their request. Later on Cow Keepers' Clubs

were formed where about 60 selected dry cows were sent from Bombay by rich persons of Poona. The milk yield of these animals was quite satisfactory as also their progeny which was exhibited at the shows. This work was, however, hampered because Government help was not forthcoming and they could not raise sufficient funds from the public for continuing this work. In spite of this failure he believed that such associations were necessary in order to awaken the people to the necessity of this work and they could be worked successfully if only provincial Governments were prepared to help these associations and run them under their supervision with the support of non-official agencies. These associations must have their district counterparts and village committees, and the latter should function as Cow Keepers' Clubs where stud bulls should be kept, cows registered and marketing and other facilities provided to the villagers for the sale of their dairy products and new stock. He said that these associations were likely to succeed because much support was expected from Gowshalas and other charitable associations who appreciated this sort of work.

Sardar Bahadur Datar Singh (*Punjab*) wanted to know whether similar work was being done in the States. He said that during the last Cattle Show a Sahiwal Breed Society had been formed and was going to be registered in the near future. He hoped that similar societies would be formed for other breeds. In the Punjab there were hundreds of people, besides the grantees, who reared different breeds of cows and buffaloes and had made it their profession. He thought that in the beginning it would be better if these societies were limited to the province or local area of the breed but where the breed was of all-India importance, it would be better if more people from different parts of India started taking interest in the breed.

Rai Bahadur Chatterjee (*Orissa*) said that in his speech he had omitted a few facts regarding the improvement of cattle in Orissa. At each centre within a radius of 5 miles all cattle were protected against rinderpest by goat virus inoculation and the scrub bulls were castrated. A Murrah buffalo breeding centre was being established. Cattle shows were held in the province every year. Last year they had six shows and this year there would be two shows in each sub-division of the province and they would be financed by the Associations and the Veterinary Department. A good number of prizes were given to encourage cattle breeding. A number of pamphlets relating to care of cattle, feeding and protecting from diseases were also being freely distributed.

Mr. Badami (*Hyderabad*) said that most of the work in the Hyderabad State was being done so far through Government agency but efforts were also being made to rouse interest in private breeders.

He thought that it would have been better if the provincial representatives in British India had only given actual figures regarding the work of the associations instead of generalising the action taken. In Hyderabad, Government were trying to foster all such improvements for the people and were rousing private activity but all associations or breeders societies looked to contributions by Government. In reply to Sardar Bahadur Datar Singh's query he stated that the States were also carrying out the improvement work but rather in a different form. They were a bit slow but sure.

Mr. Richards (*United Provinces*) said he was glad that Mr. Sayer had raised the question of well-to-do people improving their cattle. One of the reasons why Indian cattle had not been improved to the same extent as in other countries was that wealthy people had neglected this problem. One of the biggest landlords is located in Delhi and it was true that he had stimulated cattle improvement. There was a wonderful park here in Delhi, if it had been in England, would have been used for maintaining a pedigree herd. It could be divided into paddocks which would serve not only for displaying excellent breeds which had been described and recognised, but could also be utilised for grass improvement for which there was a great need. They could have a permanent Cattle Show at their door under India's greatest landlord. Cattle Shows were a potent means of stimulating interest in cattle improvement. Prior to the period of financial stringency funds had been available in the United Provinces for this purpose but in recent years they had been greatly restricted. The United Provinces Government realised the importance of this aspect of the problem and were considering the allotment of increased provision for the holding of cattle shows. He finally added that if any resolutions were to be recorded he would propose " That the importance of local shows might be brought to the notice of Governments with the request that they make necessary provision both for their organisation and for finding the necessary funds for adequate cash prizes ".

Mr. Wazir (*Kashmir*) said that as he understood it the objects of establishing associations was to bring the agriculturist more in close touch with the work of cattle improvement and to augment their interest in this work. With a similar aim in view, the Kashmir Government had already constituted a Standing Committee for Agriculture with elected members of the Assembly. They reviewed the work of the Agriculture, Animal Husbandry and Co-operative Departments. This being considered insufficient to infuse the right spirit among the people, Government had now constituted a Board of Agriculture consisting of officers of departments concerned and also six agriculturists. The activities of the departments were scrutinised by this Board and suggestions were put forward on behalf of the people. There was a bill before the State Assembly for compulsory castration of scrub bulls in selected areas and the issue of licences for approved bulls. Premium bulls were issued to zamindars by Government. Four shows were held every year where local committees had been constituted who with the help of Government officials and the Minister-in-Charge stimulated cattle breeding work. Rs. 500 to 800 worth of prizes were distributed among zemindars. The results were satisfactory.

Rai Sahib Ghose (*Assam*) said that in Assam they recently held a Cattle Show which was opened by His Excellency the Governor and prizes were given in cash and certificates and medals were awarded to the best exhibits.

Mr. Badami (*Hyderabad*) said that in the Hyderabad State cattle shows were held in the Districts, Talukas and villages and were divided into six classes, A, B, C, D, E, and F and contributions were made by Government to each class according to the size of the show. He said that the Hyderabad State was spending large sums of money on Cattle shows.

Mr. Kerr (Bengal—offg. Animal Husbandry Commissioner) said that several points had been brought out in the course of the discussion and he felt that it would be advantageous if each Province or State could send a note to the Council in regard to the organisation they proposed or that they had established, together with a concluding paragraph about the success achieved. This, he said, would be circulated to all the Provinces and States with some additional suggestions from the Council. This procedure would be helpful to the Provinces and States in developing the existing organisations or in setting up new ones.

In answer to Mr. Bruen, Mr. Kerr said that the note should cover only the points which were discussed under subject 15 and should not include anything about breeding societies.

He further observed that great care should be exercised in regard to the maintenance of the gift bulls. The mere granting of monthly donations for maintenance would not ensure the supply of good bulls, but one should adjust his programme in a way that he would get the best result out of the money spent.

One of the items of work of these associations would be to arrange cattle shows in districts and sub-divisions and it would be necessary to keep these associations alive with the assistance of some Government subsidy. The Government of India had given a lead in the direction of holding cattle shows and had contributed Rs. 3 lakhs for the all-India Cattle Show. The All-India Cattle Show Society had been registered and the first show of this Society was held last week. As in the case of the Horse Show Society, the first thing for the Cattle Show Society was to collect funds in order to put the show on a sound footing. The Cattle Show this year had demonstrated the interest which was taken all over India in good cattle and the exhibits were good. He expressed the hope that the Provincial Governments would follow the lead given by the Central Government and organise cattle shows. The village, district and provincial cattle shows would help to select the best breed of cattle available in a province for exhibition n the all-India Cattle Show. The value of cattle shows was immense, as it helped the cultivator to realise more money for his good stock. Mr. Kerr said that a prospective buyer of Indian breeds of cattle from Ceylon attended the all-India Show and was put in direct touch with the people from whom he could purchase his cattle.

The Chairman then summed up the discussion on this subject and the Board passed the following resolution :—

> " The Board recorded the progress in different provinces and noted that since local conditions vary, regional and district associations are more immediately important han provincial associations. They note with satisfaction the greater linking up of cattle improvement with general rural development activities. There is welcome evidence of increased Governmental activity. The Board desires to emphasise the importance of organising unofficial efforts in order that continuity may be insured."

Mr. Garewal (Punjab) said that in the Punjab and the Central Provinces money was not forthcoming after the first few years for expenses connected with the holding of cattle shows.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that the Board had some indication as to the way in which money was raised for these purposes in the North-West Frontier Province. It would help the other provinces also if they would devise some means for finding the money. He said that he advocated a poll tax of an anna per head of adult cattle in Bengal, but his proposal was still under consideration. He requested the members of the Board to send in their suggestions to the Council in regard to the ways and means of finding the money necessary for cattle improvement.

Mr. Bruen (*Bombay*) said that in Bombay they held cattle fairs weekly, bi-weekly, monthly and quarterly. These fairs were held either by the municipalities, the local boards or the villagers themselves. At these fairs the seller and buyer had to pay a certain amount to a fund which was collected by the respective bodies. He made several attempts to get a percentage of this money for cattle improvement, but the authorities concerned were not willing to give it. He cited the example of the village o Baswat in the Bombay Presidency where a sum of Rs. 15,000 to 20,000 was collected annually. He said that much progress could be made if at least 10 to 15% of the sum collected in the whole province could be allocated for cattle improvement. In his budget the allotment for cattle show was Rs. 750 only and he was carrying on these shows with help of the gowshalas.

Mr. Garewal (*Punjab*) said that in the Punjab the local boards were also spending a good deal of money on the purchase of bulls but they were unwilling to spend any m ney on cattle shows.

Major A. H. Sadik (*Patiala*) said that the Patiala Government were spending large sums of money on cattle shows and held 3 big cattle shows in which there was a large sale of cattle.

Mr. Takale (*Central Provinces*) said that in the Central Provinces they were having several cattle shows and were distributing prizes.

Rai Bahadur Chatterjee (*Orissa*) said that at the Cattle shows demonstrations should be given regarding the construction of model sheds and cultivation of fodder crops.

Mr. Shah (*N.-W. F. P.*) said that he annually received Rs. 3,000 from the District Boards and a grant of Rs. 3,500 from the Government for holding village shows. These shows were held in villages where the progeny of cattle was exhibited. Large number of people attended these shows and he suggested that a license fee be levied on the tongas that collected there; the amount collected being devoted to cattle improvement.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that though the district boards collected something like Rs. 30,000 to 40,000 from the cattle fairs, only a little of this amount was spent for providing amenities for cattle that came to the show, and the rest was spent in making roads, drainage, etc. He suggested that the Board might make a recommendation to the effect that cattle fairs should be brought within the ambit of the Local Markets Act so that they would also become regulated markets, have their market committee, and fixed market charges. A certain proportion of these market

charges could be devoted to cattle improvement and the rest for providing amenities for cattle, cattle owners, and the people who came to see the fairs.

Major Sadik (*Patiala*) said that a fair portion of the money derived from the cattle shows was spent on better marketing, better amenities for cattle, etc. He suggested that the number of the cattle shows to be held every year should be increased so that there would be more income.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that in Bengal a contract for holding and management of cattle shows was auctioned to the highest bidder so that all the income from the show went into the pocket of the contractor. As a result of this auctioning system the Government and the contractor benefited. He said that during his recent visit to the United Provinces he had a discussion on the subject with the Hon'ble Minister for Agriculture and he was only too willing to give all help in the matter. Mr. Kerr, therefore, suggested that all officers of the Animal Husbandry Departments in the provinces should impress upon their respective Governments as to how the cattle shows could help cattle improvement. The matter of financing the shows must be left to the ingenuity of each Animal Husbandry Department in each Province who would tap the most likely sources from which they could obtain money. He supported Mr. Livingstone's suggestion that the fairs should be treated as regulated markets.

The Chairman, in response to an inquiry as to what other sources should be tapped for getting money for cattle improvement, suggested that suggestions in regard to cattle fairs would have to be considered fundamentally in the Cattle Marketing Survey Report. The marketing survey reports that had come out already had drawn attention to the basic need for regulated markets and for regulated charges therein. He said that the method of raising money must be left to the provinces, especially the Animal Husbandry Departments. After some further discussion it was agreed that the cattle shows were the most important item in the programme of cattle improvement, and the Board adopted the following resolution :—

> " The Baord desires to emphasise the value of properly organised cattle shows. It notes with satisfaction that the Central Government has provided finance for the all-India Cattle Show for a term of years and that a Show Society has been registered. District and local shows are of the greatest importance and the Board recommends that Local Governments should ensure adequate provision for the organisation and holding of such shows and for substantial prizes."

A note on the correlation between soil deficiencies, poor cultivation, unthrifty cattle and human malnutrition (*Subject No. 19*).

In introducing this note *Dr. Lander* (*Punjab*) said that this item covered a very wide range on which much knowledge had already been accumulated. Speaking of his investigations carried out in the Kangra Valley in the Punjab, he ob erved that it was a hilly tract subject to a very heavy rainfall and was also one of the most densely populated tracts in the country. Not only were the cattle of the Kangra district of a small size but a majority of them were

dry during the greater part of the year. The average weight of the Kangra Valley cow was 400 lbs. The main fodder of these cattle during the greater part of the year was rice straw very rarely supplemented by concentrated food. It was deficient in protein, calcium and phosphates. One of the interesting facts observed was that there was no parallelism between the calcium phosphates in the soil and that found by analysis of fodders grown on it. This showed that though a soil may show certain conspicuous deficiencies, those deficiencies need not necesarily be reflected in fodder crops grown on them.

Along with these particular features in regard to fodders and soils the inhabitants were also suffering from Osteomalacia, Goitre, Leprosy and many other diseases which were directly correlated with malnutrition. During the survey of which he had complete records, the family records of diets showed that in many of the families in which Osteomalacia and other diseases were most conspicuous, the total calorific value of the diets taken daily were well above normal. The dietary of many of these families consisted of cereals only and was particularly lacking in fresh fruits, vegetables and dairy produce. Not only the poor peasants and labourers were suffering from these diseases due to lack of some essential constituents in the diet but the well-to-do people, both Indians and Europeans, were also suffering from malnutrition. This phenomenon presents itself in several other parts of India as well. The Nutrition Institute at Coonoor has collected extensive data on this subject and it has also been shown how at a very small cost the working class in this country can obtain an adequate dietary. He added that a great deal of illness in this country could be prevented if only people were adequately fed. Vast sums of money were spent for curative measures but larger sums must be spent on preventive measures that is to say for providing improved agricultural operations, distribution of improved seeds and essential foodstuffs and he suggested that this question might be taken up on an all-India basis. Each Province should endeavour to concentrate on most outstanding features of malnutrition in their territory and having found out the causes, should set to work the machinery to remedy them. That finally resolved itself into an administrative action and agricultural improvement.

The Chairman said that this subject had also been discussed in the Standing Animal Nutrition Committee of the Indian Research Fund Association, and the deficiency diseases in the Kangra Valley were particularly discussed. The first stage of the surveys showed that deficiency diseases existed in human beings and animals. A very comprehensive series of diet surveys were made there to which Dr. Lander had just referred and it was particularly interesting to note that Dr. Lander's note suggested the need for better agricultural planning.

Mr. Gareval (*Punjab*) said that people in the Kangra Valley were very poor and were not hard working either, and unless they could be made to work hard and unless their agricultural conditions were improved he doubted very much if any substantial results would be achieved.

The Chairman pointed out that even well-to-do people there were suffering from Osteomalacia.

Mr. Wali Muhammad Khan (*Veterinary Investigation Officer, Punjab—nominated*) said that at the instance of Mr. Ware he carried out a survey of the

Kangra Valley and inspected animals in the villages and the interior of the hills. The condition of the cattle was found to be generally weak which was due to malnutrition and poor feeding, but no case of Osteomalacia was discovered.

Mr. Kerr (*Bengal—offg. Animal Husbandry Commissioner*) said that the problem which required further investigation was whether the deficiency of the cattle was due to semi-starvation or any definite deficiency. He felt that a more detailed study of the condition of cattle was necessary in order to find out if the deficiency diseases of human beings were not to some extent reflected in the cattle of the valley.

Mr. Shirlaw (*Mukteswar*) said that he could, to a certain extent, corroborate the remarks of Mr. Wali Mohammad Khan. During the last four or five years some material from Osteomalacia cases was received for examination from Assam, Bengal and the United Provinces. As a pathologist he was not able to identify this disease in any of these specimens and at this stage of their knowledge there was no evidence of any Calcium-phosphorus deficiency. The ratio of 1 : 5 which was looked upon as a criterion for proper Ca : P balance was well preserved in the serum of those animals from which these specimens were taken. He had not seen any of the specimens relating to human disease which he understood had been diagnosed in the Kangra Valley and in other sub-mountain tracts of India but he could certainly say that he had not seen any definite case of Osteomalacia in Indian cattle or horses.

Mr. Kerr (*Bengal—offg. Animal Husbandry Commissioner*) said that although so far they had not been able to demonstrate Osteomalacia pathologically in cattle in India he felt that a further investigation in the Kangra Valley and an all-India survey should be made and sufficient material sent up to Mukteswar for examination, as a number of veterinary diseases did not manifest themselves unless constantly worked upon.

[*Mr. Crawford* (*Ceylon*) suggested that in order to see whether Osteomalacia existed in cattle in Kangra they should import bigger animals into the valley as they suffered more than the local cattle.]

In reply to a query raised by Mr. Bruen, *Mr. Shirlaw* (*Mukteswar*) said that on receiving complaints from Remount Officers of low birth rates and abortions in Bombay, considerable amount of work was carried out but they could not detect evidence of any infection. As workers in other countries, notably America, had brought into prominence the idea that Calcium deficiency is related in some cases to abortion and failure to conceive, the knowledge was applied to these cases in Bombay. The Veterinary Officers were asked to supplement the diet of these animals with known brand of minerals, chiefly *churn* brand, which was a very reputable source of mineral supplement. Adoption of this supplemented diet acted like a charm, the barren animals began to calve and there was no case of abortion. Two years ago this practice was stopped and soon after the original trouble reappeared without any warning. The Veterinary Officers were again referred to the original suggestion which was adopted and once again these animals behaved like normal healthy animals. In this experiment there was a certain and convincing evidence, that the breeding difficulties were definitely related to mineral imbalance.

Mr. Mahajan (*Hyderabad*) said that he had investigated Osteomalacia in cattle in Hyderabad and he was surprised to hear the statements in the meeting that there were no cases of Osteomalacia in cattle in India. From the work carried out regarding symptoms and lesions in bones and hooves coupled with lameness and chronic emaciation and from analysis of fodder and serum samples it was evident that this condition was due to a deficiency of phosphorus. Again, from what Sir Arnold Thieler had described in South Africa, it was clear that Osteomalacia in cattle was a manifestation of Aphosphorosis. The soil in the areas involved in Hyderabad was also analysed and it was found to be deficient in phosphorus. He referred to the valuable remarks made by Mr. Crawford and said that the animals that mostly suffered were the imported cattle from Ongole and other districts of Madras Presidency, weighing between 800 to 900 lbs. The local animals also suffered but not to the extent as the imported ones. The ratio of incidence was 70 to 80 per cent. in the imported to 10 per cent. in the indigenous cattle.

Mr. Shirlaw (*Mukteswar*) said that recently a lot had been heard about outbreaks of Osteomalacia in Indian cattle. Considerable number of cases had been reported by Veterinary Investigation Officers in the provinces but the material received at Mukteswar was insufficient for the purpose of a confirmatory pathological diognosis. He, therefore, requested Veterinary Investigation Officers to supply detailed clincial information and sufficient morbid material to Mukteswar for pathological examination. Incidentally, he drew their attention to the condition known as Osseous dystrophia which may be confused with Osteomalacia. He then described briefly the essential features of Osteomalacia, as commonly encountered in cattle, dealing especially with the nutritional and biochemical factors involved.

Mr. Viswanathan (*Veterinary Investigation Officer, Madras—nominated*) said that the condition described by Mr. Mahajan was also noticed in Madras in the districts of Kurnool and Cuddapah bordering Hyderabad State. He collected samples of serum from affected animals and sent them to Mukteswar for examination to find out whether there was any deficiency in calcium or phosphorus. The results showed that calciumphosphorus balanced was normal. He also sent samples of fodder from some affected villages to the Agricultural Chemist, Coimbatore, who observed that there was a great imbalance between calcium and phosphorus and that there was a phosphorus deficiency. Analysis of samples of water showed the presence of fluorine. In some villages human beings were also affected, the prominent symptoms being difficulty in breathing and irregular bony prominences in the forearm and in some cases brownish pigmentation and mottling of the teeth. Another feature noticed was that only imported cattle were suffering, especially the Ongole and some Mysore bullocks. Not even a single indigenous cow, buffalo, sheep or goat was affected and the majority of the affected animals were working bullocks. From the available information it was suspected that the trouble was due to groundnut feeding.

Dr. R. K. Pal (*Indian Research Fund Association*) said that Osteomalacia in human beings was not always a visible manifestation. In the early stages of calcium deficiency there was a latent phase characterised by irritability of nerves and parathyroid deficiency. The same was possibly the case in cattle too and in that case this could only be diagnosed by biochemical tests, etc.

He suggested that this work should be carried out in other areas like Chotanagpur, in Bihar and Assam where similar calcium deficient soil, unthrifty cattle and human malnutrition existed. It passed his comprehension that while calcium deficiency was deflected in fodder crops, it did not do so in human food crops in the Kangra Valley. Although the etiology of Osteomalacia was not fully known yet, calcium deficiency as the possible cause had not yet been ruled out. The reason why administration of cod liver oil improved cases of Osteomalacia was probably due to the fact that vitamin D content of the cod liver oil economised the calcium need of the system, so that the system could maintain health with a smaller quantity of calcium.

Summarising the discussion, *the Chairman* said that this subject was of special interest as it had brought out quite clearly that malnutrition in Kangra Valley was due to unsatisfactory system of agriculture which led to insufficient supplies of animal products (milk). Whether there was any direct relationship with calcium or other deficiency seemed doubtful. It was also clear that one could not get down and say all was well because the analysis of fodder showed no calcium deficiency. Deficiency in calcium would not produce proper crops and it has to be remedied. He further added that it was necessary for the Veterinary Investigation Officers to keep in close touch with Mukteswar in regard to the investagation of obscure problems. He was sure that Messrs. Shirlaw and Haddow would be too pleased to give every possible assistance. The Board did not consider it necessary to pass any resolution on this subject and the discussion was recorded.

The improvement of the indigenous breeds of horses (*Subject No. 16*).

In introducing the subject, *Mr. Shahi* (*Assistant Animal Husbandry Expert*) said that the Council was trying for some time past to collect information on this subject, but the information collected so far, which was incorporated in this paper, was still somewhat unsatisfactory. The total equine population of India, according to the 1935 Census, was estimated at about 1·4 millions and there had been a distinct increase of about 14,800. The figures published by the International Institute of Agriculture, Rome, showed that India ranked as the ninth country in regard to horse population in the world. In spite of all this the horse population of India was of a nondescript type. The reports received from the Provinces and States showed that, except in one or two provinces or States where breeding activities were going on, there was much to be done in the matter of improvement of horses in most of the provinces and States.

Mr. Shahi then referred to the indigenous breeds of horses mentioned in his note and also to the controversy which was going on that the improvement of horses should be taken up mainly from the point of view of racing. He said that what was wanted was that efforts should be concentrated on the utility type of horses in this country as there was a considerable demand for this type of animal. In spite of mechanisation of transport and other factors that have contributed to the decline of horse breeding, there was a great demand in some parts of the country, especially in the Terai, for the utility type of animal.

Further, he observed that during recent years considerable attention had been devoted to the investigation of equine diseases and the much dreaded infection, Surra, was now successfully combated all over India.

Mr. Shahi then read out extracts from the information received from Manipur in Assam and Jodhpur regarding the Manipur and Marwari breed of horses existing in these places. Dr. Fernandes, Director of Veterinary Services, Jodhpur, had intimated that His Highness the Maharaja of Jodhpur was taking a keen interest in horse breeding and that a good amount of money was spent for this purpose. The Education, Health and Lands Department had recently circularised Provincial Governments that wherever suitable indigenous breeds exist attempts should be made to improve them and any schemes in this connection should be submitted to the Imperial Council of Agricultural Research. In response to this circular a scheme costing about Rs. 35,000 had been received from Bengal which would be considered by the Advisory Board of the Council. In conclusion Mr. Shahi said that the problem of scientific production of horses, as of all forms of livestock, should aim at something specific and utilitarian—leaving it for private enterprise to develop the " Specialist " animal such as race horses. The problem to be solved was as to who was to take the responsibility for grading up horses and find the necessary funds.

Lieutenant-Colonel Blood (*National Horse Breeding and Show Society of India*) narrated the objects of the Horse Breeding and Show Society of India. The main object of this Society was to improve all types of horses in India. The finances of the Society consisted mainly of donations from Princes and other interested people in India and the interest of the capital was spent on the objects of the Society. In addition to this, they got financial and other help from the Turf Clubs.

He said that it was not correct to say that the Horse Show Society interested itself in race horses only. The Society sanctioned grants for horse breeding, for investigation into the diseases of horses, prize money to certain turf clubs to encourage racing of indigenous breeds, etc. A sum of Rs. 53,400 had been distributed by the Society last year for the purposes mentioned above. The aid of the race course was resorted to in order to test the various lines of blood which were used in breeding and to find out which were the most suitable. Secondly, it was only on the race course that breeders got a suitable market for their horses. The Society was, therefore, working in close collaboration with the Calcutta Turf Club and the Royal Western India Turf Club. Colonel Blood said that the Calcutta Turf Club promised to give the Society ten valuable stallions for breeding purposes and that the Royal Western India Turf Club under their Brood Mare Scheme assisted the Society with mares which were distributed to the zamindars under certain conditions. The young horses bred by the Zamindars were auctioned at the Turf Club in Bombay and they fetched as much as Rs. 13,000. He concluded by saying that the Society worked for the improvement of the quality of horses bred in India.

Mr. Egan (*United Provinces*) said that horse breeding activity in the United Provinces was controlled by two Departments. The Western portion of the province, which was more suitable for horse breeding, was controlled by the Army Remount Department, and the rest of the province was under his control. He said that a good number of stallions was stationed in places where their horse breeding work was in progress. Experience had shown that the introduction of Arab blood was one of the most sound features in the

breeding of horses, particularly from the utility point of view. As regards diseases, Mr. Egan said that Surra was successfully tackled in the United Provinces. He regretted that much attention was not devoted previously to horse breeding and he wondered whether the attempts now being made were not too late.

Mr. Badami (*Hyderabad*) said that in the present circumstances any attempt to concentrate on indigenous types on a large scale was more an academical rather than a practical problem. Next to the Punjab, Hyderabad was the largest producer of horses. About 50 years ago it was the chief centre for the purchase of all remounts wanted for the State forces. After the Mahratta Wars, the horse breeding industry was transferred to the Punjab. He suggested that the Provinces and States should take up the extensive breeding of indigenous horses existing in their territories. Twenty years ago, in Hyderabad, they had 72 stallions spread over 6 districts, but today they had hardly 32 stallions. Government were prepared to provide funds for stallions but the suitable mares were not available. At present Hyderabad State was the main source of supply of Jhatka and tonga ponies to Madras Presidency. The breeding of such ponies was, however, rapidly decreasing on account of the rapid increase of motor traffic. The zamindars were not prepared to take up horse breeding as there was no market at all for high class indigenous ponies. He strongly recommended that the State should employ indigenous ponies for the police force and other local uses at least.

Mr. Bruen (*Bombay*) pointed out that the statement on page 5 of the note, *viz.*, " The Western India Turf Club has been very helpful in maintaining the breed by patronising the organisation of special races for Kathiawar horses " was not correct. The Chairman promised to have the point looked up.

Mr. Shirlaw (*Mukteswar*) commended the perusal of a book written by Colonel Seely on the future of horses in India. Colonel Blood had referred to financial help which the National Horse Breeding and Show Society had extended to Mukteswar for the investigation of equine disease generally, and to equine sterility in particular. He explained that the programme of work at Mukteswar was started in 1936 and during the last two years, they had made a decided progress in the scheme. They had found that breeding problems in Indian horses did not materially differ from those in other countries. He had recently toured in the Punjab to see some of the horse-breeding establishments and undertook an extensive examination of horses which had proved useful for a number of years. Colonel Cole had placed at his disposal certain mares which he had decided to condemn and on examination of these animals Mr. Shirlaw found that the problem of sterility as had been described by Smith who had been working on this problem for 35 years, was definitely connected with an infection. He said that this infection could be prevented by paying more attention to hygienic measures generally. He said that he wished to point out this fact because sterility was undoubtedly the biggest problem affecting horse-breeding.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that in Bengal they had been paying a good deal of attention to indigenous horse breeding and acknowledged the valuable financial help that he received at all

times from the Calcutta Turf Club. They had been trying to improve the Bhutia breed of horses which were seen in races at Darjeeling. They had also got pack animals that came from Tibet. Few of them were, however, good and all of them were beyond breeding age so that the scheme of breeding them in India was not practical. Again, in Bengal, there were Manipuri horses which were popular both in Shillong and in Dacca. They were good race ponies.

Mr. Garewal (*Punjab*) said that a definite programme of work should be chalked out for all the Provinces. Unless this was done, there was no hope of making any headway in improving the breeds of horses in this country.

Mr. Sayer (*Imperial Agricultural Research Institute*) pointed out that there was a statement in the Note that the ponies that came from Kangra and Kulu Valley had good bone and a compact body. He enquired as to how this statement conformed with the statement made by Dr. Lander that human beings and animals in the Kangra Valley were not well developed on account of malnutrition.

Mr. Shahi (*Assistant Animal Husbandry Expert*) said that these ponies came from beyond Kangra Valley, *i.e.*, Lauhaul pass and were not indigenous to Kangra.

Mr. Hurley (*Madras*) said that there was very little horse-breeding done in the South. The ponies there came from Hyderabad and for years there has been a shortage of country-bred race horses, so much so that some of the races had to be split up between country breeds and imported horses. He did not see any reason why in suitable places a suitable type of horse could not be bred to meet the demand. He was not as pessimistic as Mr. Badami and he did not agree with those who said that with the development of motor cars and roads horse-breeding would go down, as it was quite likely that the next generation might develop a ' horse sense '.

Khan Sahib S. M. A. Shah (*N.-W. F. P.*) said that indiscriminate distribution of thorough-bred blood had absolutely wiped out the indigenous breeds of horses. In the Frontier Province, for instance, it was now difficult to find the Baluchis which were famous at one time.

Mr. Jerrom (*Sind*) said that in Sind horse-breeding had been done in a very limited way. At present they had five stallions, four of which were thorough-bred and one Arab. In his opinion the Arab was the best stallion but people did not care very much for it. They preferred Marwaris, Kathiawaris and Baluchis but none of these were available, and if a few could be obtained they were very expensive.

Mr. Garewal (*Punjab*) said that if the importation of foreign breeds were stopped he had no doubt that the indigenous breed could be very much improved. The present policy in regard to the improvement of cattle-breeding was to improve the indigenous breeds and the same policy should be followed in the case of horse-breeding with a view to reviving the old breeds. He realized that it was very difficult to find the old breeds of horses but the same was the case with, for instance, the Dhani breed of cattle of which in 1918 it was difficult to find even a single bull but now about 300 bulls could easily be found. Working on similar lines the indigenous breeds of horses could be improved gradually by proper selection, better feeding and management.

Referring to the diseases in horses, *Mr. Shirlaw* (*Mukteswar*) said that after many years of work it was only within the last three or four years that some results had been achieved. According to the present knowledge, Kumri had a very distinct relationship clinically and pathologically to disease which was known as equine encephalomyelitis. This disease was unfortunately on the increase. Two years ago Kumri was restricted to areas in North Bihar but it now seems to have spread out into other tracts of Northern India and is advancing westward not in the form of Kumri but in the form of equine encephalomyelitis. As regards the tracts in North Bihar it was known that there were certain distinct areas which were affected and Mr. Sahai had recently published a note on an outbreak of equine encephalomyelitis in Police horses. He thought that after many years of work they were not on the correct track and before long they should be able to come to some definite conclusions about Kumri and equine encephalomyelitis.

Mr. Richards (*United Provinces*) said that although he was not qualified to speak on horse breeding he thought there was more hope of recovering the indigenous types than was expressed by previous speakers. It was difficult to accept the views expressed that such strains had been lost completely through extensive cross breeding unless those strains were very limited in their original range. It appeared to him that the infusion of foreign blood could not have been so general throughout the whole of the breeding tracts of India as to dilute the indigenous stock down to vanishing point. He considered it necessary, however, that for each breed which it was hoped to re-establish the breed characters should be very clearly defined so that the breeders would have a definite standard to work upon in making the best of the material available.

Rai Sahib S. C. Ghose (*Assam*) said that it was very important to improve the indigenous breeds of horses. In Assam, there was a breed known for centuries as Manipuri breed of ponies, which had earned a reputation both for endurance and speed but the breed was fast dying out and if it was to be saved from extinction something must be done without delay. He did not agree with Mr. Badami that there was no market for indigenous horses. He knew that there was an ever-increasing demand for the breed which they had in Assam. As a matter of fact its price had gone up cent per cent and in spite of the fact that Manipuri State authorities had imposed a tax on sale the demand was still very high. He referred to Major General Sir James Johnston's remarks in his book entitled " My experience in Manipur " written nearly 50 years ago describing this breed " as a famous breed of ponies which was extensively used in the cavlary in the 18th century ". There was also evidence that polo play was first originated in Manipur where these ponies were used for this purpose. Surely, it would be a pity to let such a breed die out. If this breed was to be improved, financial help from an outside source would be necessary for the Assam Government was not rich enough to bear the entire expenditure of such a horse breeding scheme. If the scheme could be subsidised one of the finest breeds of indigenous ponies would be saved.

The Chairman said that in the course of the discussion there had been one or two hints that the Council might come forward with money. The policy of the Council was laid down by the Governing Body which contained Ministers from all Provinces. Generally speaking, when horse breeding questions came

up before the Council, the view of the Governing Body had been that horse breeding was only an agricultural occupation in a limited part of India. Finally he observed that if anything had to be done for the improvement of the indigenous breeds, the first thing was to have definitions of characteristics similar to those for seven breeds of cattle. At the moment the urgent problem was the preservation of these breeds in view of the great difficulty of getting them. This would not commit provinces to large scale breeding operations. If one could work with artificial insemination they could do more but this point required working up. He suggested the drawing up of a note by each province as regards their own indigenous breeds and to send it to the Council for discussion at some future date to see whether they can get to something concrete and and whether progress could be made along the lines to be discussed.

The discussion was recorded.

The mineral contents of some natural and cultivated fodders in Travancore and their bearing on animal nutrition (Supplementary note on Subject No. 19).

Mr. Narayana Iyer (Travancore) explained the details of his paper on this subject and promised to send results of the analysis of different fodders grown under varying conditions.

Mr. Hurley (Madras) referring to Mr. Menon's paper said that he agreed with Mr. Menon that " the cattle on the hilly wet regions of the west coast, where green grass is available practically throughout the year, were notoriously poor in quality both in size and milk yield compared to those on the dry eastern plains ". He said in that particular area cattle were very small and sterility was common. He had some experience of feeding cattle in that area with minerals and this had effected considerable improvement.

Dr. Lander (Punjab) pointed out that the data presented might be augmented regarding variations in the mineral content of the grasses under record at various stages of growth and also the successive cuttings made during the season.

The Chairman in summing up the debate said that he was glad that analyses of Indian grasses had been done, but still there was lack of precise information. Whenever a problem like this arose, if it was a problem of soil deficiency, the first thing to do was to do fertiliser experiment and to see how it affected the yield and quality. This line of approach saved much time. The Chairman said that these papers might be recorded and that no resolution was called for.

The migration of cattle between provinces and states with reference to its effect on— (a) the control of contagious diseases, (b) the breeding of pure stock (Subject No. 17).

Mr. Hurley (Madras) introduced his paper on the subject and said that he had confined himself to Rinderpest, because the information about the prevalence of other diseases, which were likely to be transmitted, was meagre. He said that the experience in Madras was that movements of cattle spread rinderpest. Among the other diseases which might be transmitted by migratory cattle was contagious abortion. Till recently it was supposed that the

incidence of contagious abortion in Madras was negligible, but it had been brought to notice by the activities of a co-operative breeding society. He suggested that in order to control the spread of the disease, prophylactic measures should be adopted, the movement of cattle should be completely stopped and quarantine stations should be set up. He doubted whether the last two measures mentioned by him would be feasible but added that if the measures suggested by him were adopted, the incidence of mortality due to rinderpest would be considerably reduced.

Rai Bahadur Pillai (*Central Provinces*) said that he entirely agreed with the views expressed by Mr. Hurley. In the Central Provinces the migration of cattle begins in the middle of October and continues upto the end of June. In order to prevent the spread of disease in the province, the Central Provinces Cattle Diseases Act, 1934, was passed. This act was put into operation 2½ months ago in two districts and the number of cattle that had passed within this time was 35,000. The Act had prescribed certain rules and the Quarantine Officer was invested with certain powers. He concluded by saying that the Act in the Central Provinces was working well.

Mr. Garewal (*Punjab*) sounded a pessimistic note and said that the position in regard to the incidence of rinderpest and other diseases was the same as before. He described the work that he had carried out in the Central Provinces for the prevention of the diseases of animals with the aid of a grant from the Research Council. He said that the control of diseases like hæmorrhagic septicaemia required some effective legislation and unless there was simultaneous action in all the provinces no progress could be made. He said that in Nagpur some cattle were examined for tuberculosis and about 30 animals were suspected to be suffering from this disease. With a view to eradicate this diseases, he approached the higher authorities for funds for compensation to the owners whose animals were to be destroyed, but the reply he received was that no funds were available and if cows were destroyed a riot would ensue. He was, therefore, powerless to do anything.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that from the information collected from ten families in the Central Provinces, it transpired that they had to take their cattle for sale to Raipur which was 300 miles away from their homes, and the journey occupied three weeks at the end of which they lost 50% of their cattle through sickness. No doubt, these animals must have spread diseases on their way. The practical solution would be to make it possible for the owners of cattle to rail them to the place of sale. He cited one or two instances where the railway authorities ran special cattle trucks.

He added that the spread of disease could be prevented if the cattle in big cattle fairs were inoculated and dipped.

Mr. Garewal (*Punjab*) said that in the Punjab they were unable to do anything in this connection for want of funds. The District Boards were either unwilling or were too poor to spend any money. He advised some of the District Boards to stop these cattle fairs, but they could not do so as they derived some substantial revenue from these fairs. He appealed to the Board to make a recommendation to the Council for some grant for this work.

Mr. Bruen (*Bombay*) said that in the Bombay Presidency the cattle breeders moved with their cattle from place to place for about six months. They grazed their cattle without incurring any expenditure on the way and sold them all along the way. During their journeys they spread contagious diseases. It was proposed to include this traffic under the provision of the Grazing Rules, but the Hon'ble Minister for Agriculture did not agree on account of the very large number of veterinary surgeons that would have to be employed to control diseases of these wandering herds, which moved in all directions. In Mr. Bruen's opinion it was impossible to control disease in these wandering cattle unless they were dealt with at regular intervals of a week or so.

Mr. Naik (*Veterinary Investigation Officer, Bombay—nominated*) drew attention in this connection to recommendation No. (9) made by Mr. Farbrother in his note on subject No. 18 of the agenda.

S. Balwant Singh (*Veterinary Investigation Officer, Bengal—nominated*) suggested that when any action was taken for the prevention of diseases in cattle, bovine abortion must also be considered.

Mr. Garewal (*Punjab*) enquired whether the Indian States could not be persuaded to keep more veterinary staff with a view to control contagious diseases. He added that the question of control of contagious diseases in India was a central subject and the Government of India should move in the matter. The Chairman, however, pointed out that it was a central subject only to a very limited extent. It was mainly provincial.

Mr. Egan (*United Provinces*) agreed with Mr. Bruen that the question of movement of stock was a big problem and the Veterinary Departments in the Provinces could not even touch the fringe of the trouble. He was in favour of a central legislation particularly in regard to severe epidemics.

The Chairman, in explaining the position in regard to central legislation said that both the Animal Husbandry Wing at Madras and the Advisory Board discussed this question of a central Act for the control of contagious diseases. The question was under the consideration of Government at the present moment. It was a particularly difficult constitutional problem as much of the legislative powers were reserved to the Provinces and this Board could not go much further with this question this afternoon. He asked whether there were any further practical conclusions which the Board could come to on this point. There were very old and well defined routes along which cattle moved, *e.g.* herds of cattle were moved from Hissar, Rohtak, Gurgaon, passing through the Provinces of Delhi, United Provinces, Bihar, reaching down to Calcutta. Similarly there were five regular routes in the Bombay Presidency. He asked if something could be done to control diseases on these regular routes.

Major Sadik (*Patiala*) said that there should be closer co-operation between Provinces and the Indian States if any effective measures could be adopted to control these contagious diseases. At the present moment, an information, passing through usual official channels, came in the hands of the proper officer concerned much too late for any effective action to be taken. He said that the information of an outbreak of rinderpest in Ambala reached

him after 3 months after passing through the Veterinary Investigation Officer, Deputy Director, the Director of Veterinary Services, the Resident, etc. At the present moment the rules, as they stood, prevented correspondence direct between the Veterinary Officers concernd in a State and a Province.

Mr. Wazir (*Kashmir*) said that he had found in several cases that instead of a disease coming from the State to the British territory, it in fact went from the latter to the State.

Mr. Badami (*Hyderabad*) said that the Hyderabad State had come to an arrangement with Bombay Presidency, Madras and the Central Provinces whereby the Director, Veterinary Services could correspond direct with each other on such matters.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that he had found the same difficulty in Bengal as was pointed out by Major Sadik.

With regard to legislation he said that the proposed Act had already been circulated for opinion. In respect of Bengal, he said that they would not be able to implement certain portions of the Act in view of the fact that diseased cattle could come to the Province from several neighbouring States, there being no insurmountable borders. It was very difficult to put up barriers as they would greatly hamper the trade in cattle going on at present.

Mr. Shirlaw (*Mukteswar*) said that the problem could not be solved by legislation but it would eventually solve itself through education.

The Board was unanimous on one important point that it was desirable that arrangement should be made for direct exchange of information between province and province, and provinces and States regarding outbreaks of contagious diseases of cattle.

Note on measures which should be adopted in India in order to comply with international requirements regarding the examination and certification of animal products for export (*Subject No. 18*).

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) in introducing the note by Mr. Farbrother said that this matter actually arose out of a questionnaire which had been received in India with regard to certification of livestock products for export. One of the things which he was asked to certify in Bengal was guts collected from slaughter houses packed and sent to England for various uses. It was presumed that some of them were for human consumption, *e.g.* for sausages, as well as for other commercial products. To give such a certificate, slaughter houses were inspected and it was certified that the process was reasonably cleanly carried out and the stuff was suitable for purposes for which they were exported. The fact, however, remained that it was impossible for them at the present time to cope with any such problem. The slaughter houses in cities were of course inspected but the inspection left much to be desired. The suggestions offered by Mr. Farbrother were some of the ways by which the demands of importing countries could be met.

Mr. Jerrom (*Sind*) said that hides were mostly sent from the Karachi port and the certificate required by the importing countries was in a sepcified form, which stated that the hides were free from flesh and there was no danger

of importing diseases along with these hides. As regards guts, they mostly went to America where they were all sterilized before they are made use of.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that grading and marking of hides were being done at Delhi, Agra, Calcutta, Karachi and Bombay and in the United Provinces Tanners' Association had also been brought into being, to advise regarding suitable grades of hides. He thought that it would be very helpful if the Veterinary officers throughout the Province could assist in overcoming the prejudice of the local people against slaughter in slaughter-houses and against having their hides marked when they had got there. If the animals could be inspected at the slaughter-houses and their hides properly marked it would be very easy to give a certificate that they had been properly slaughtered in a slaughter house after inspection.

Mr. Kerr (*Bengal—Offg. Animal Husbandry Commissioner*) said that in order to satisfy the various demands of the importing countries a very good organisation was necessary. They were far behind such organisation at the present time. He thought that anything they could do through this Board to stimulate the authorities concerned to tighten up their regulations and increase their staff, if possible, would be very helpful.

After further discussion on the subject, the recommendations made by Mr. Farbrother in his note were taken and accepted as follows :—

1. All animals slaughtered for human consumption should be slaughtered in public slaughter-houses so far as possible and the animals subjected to anti- and post-mortem examination by a qualified Veterinary Assistant Surgeon.

2. For this examination, all local bodies must employ qualified Veterinary Assistant Surgeons as Superintendents of slaughter houses.

3. All animals slaughtered at the slaughter-houses must be certified by the qualified Veterinary Assistant Surgeon as free from contagious diseases at the time of sluaghter.

4. Bales of hides and skins should be marked in some way to indicate their source of origin and date of slaughter.

5. Periodical information regarding the incidence of diseases throughout India, infected areas and the dates from which areas are declared free, should be furnished confidentially to the veterinary authorities at the ports serving those areas.

6. A considerable tightening up of the reporting of outbreaks of contagious diseases among livestock by local reporting officers is required.

7. The introduction of legislation for the control of contagious diseases of livestock is essential so that outbreaks can be quickly supressed.

The meeting terminated at 5 P.M. to resume again at 10 A.M. on Thursday, the 23rd February, 1939.

PROCEEDINGS—23RD FEBRUARY, 1939.

The following were present :—

1. Sir BRYCE BURT, *Chairman.*
2. Mr. S. D. ACHAR.
3. Major M. S. APTE.
4. Mr. B. K. BADAMI.
5. Mr. H. S. BAWA.
6. Captain B. R. BINGLEY.
7. Rao Bahadur VISWANATH.
8. Mr. E. J. BRUEN.
9. Dr. W. BURNS.
10. Rai Bahadur N. CHATTERJEE.
11. Mr. S. R. CHADHA.
12. Mr. T. J. EGAN.
13. Mr. J. S. GAREWAL.
14. Rai Saheb S. C. GHOSE.
15. Dr. R. MACLAGAN GORRIE.
16. Mr. T. J. HURLEY.
17. Mr. K. R. NARAYANA IYER.
18. Mr. J. H. G. JERROM.
19. Mr. .M. S. JUNG.
20. Mr. H. R. KAPUR.
21. Mr. K. P. R. KARTHA.
22. Mr. R. L. KAURA.
23. Mr. P. J. KERR.
24. Mr. W. KEVENTER.
25. Mr. W. M. KHAN.
26. Mr. D. N. KHURODY.
27. Mr. Zat. R. KOTHAVALLA.
28. Mr. P. S. KUPPUSWAMY.
29. Dr. P. E. LANDER.
30. Mr. A. M. LIVINGSTONE.
31. Mr. G. J. MACDONALD.
32. Mr. M. R. MAHAJAN.
33. Mr. M. I. MALIK.

34. Mr. Y. N. MARATHE.
35. Dr. H. K. MEHRA.
36. Mr. R. N. NAIK.
37. Babu BIRBAR NARAYAN CHANDRA DHIR NARENDRA of Madhupur-Garh.
38. Dr. V. V. NIGHOJKAR.
39. Dr. R. K. PAL.
40. Mr. P. G. PANDEY.
41. Rai Bahadur R. V. PILLAI.
42. Mr. R. K. RAM.
43. Dr. H. N. RAY.
44. Mr. W. S. READ.
45. MR. P. B. RICHARDS.
46. Major A. H. SADIK.
47. Mr. WYNNE SAYER.
48. Mr. S. K. SEN.
49. Rai Bahadur R. L. SETHI.
50. Mr. S. M. A. SHAH.
51. Mr. H. B. SHAHI.
52. Mr. J. F. SHIRLAW.
53. Mr. BACHAN SINGH.
54. Rai BAJRANG BAHADUR SINGH.
55. Mr. BALBIR SINGH.
56. Mr. BALWANT SINGH.
57. Mr. BHIM SINGH GOVINDH SINGH.
58. Sardar Bahadur Sardar DATAR SINGH.
59. Mr. J. V. TAKALE.
60. Mr. RAMKRISHNA TAMPI.
61. Khan Sahib A. M. ULVI.
62. Rao Bahadur M. VAIDYANATHAN.
63. Mr. G. R. VISWANATHAN.
64. Captain U. W. F. WALKER.
65. Mr. JAMES N. WARNER.
66. Mr. V. L. WAZIR.

Mr. S. BASU—*Secretary.*

Visitors :—

1. Mr. M. CRAWFORD.
2. Dr. N. D. KEHAR.

The meeting commenced at 10-15 A. M. and lasted till 5-40 P. M. with an interval for lunch.

The etiological factors concerned in pleuro-pneumonia of goats in India (Subject No. 1).

In introducing the report of the sub-committee *Mr. Kerr (Bengal—Officiating Animal Husbandry Commissioner)*, said that Mr. Shirlaw had furnished a mass of valuable information to the sub-committee on this subject, which is comparatively new one for study and investigation in this country. This problem was of great importance from the point of view of export trade in goats and as it was still under investigation the Committee was not in a position to put up some specific recommendation. The Committee, however, observed that goat pneumonia was of very great importance, and called for a good deal of detailed investigation in various centres. The knowledge so obtained should be collated and investigation should be carried out into the correlation of this condition with haemorrhagic septicaemia of cattle.

Mr. Shirlaw (Mukteswar) stated that he had very little to add to what had been mentioned in the report of the sub-committee. The subject was thoroughly discussed and an important fact that emerged out of the deliberations was that there were more than one type of pneumonia in goats, *viz.*, the Garhwal, the Mukteswar and the submountain tract types. In Southern India they were probably dealing with an entirely different type of this malady. This is a pressing problem as the rearing of goats in certain areas is becoming difficult owing to the ravages of this disease. In his opinion it seemed necessary that Veterinary Investigation Officers should include this disease, if it existed in their respective areas, in their programme of investigation as their collaboration would be very useful in the elucidation of this problem. Further, such a procedure would help in the confirmation or otherwise of the reports received in this connection from the Provinces.

Mr. Shirlaw concluded by saying that there were several corrections in the report which he proposed to take up with Mr. Kerr.

The Chairman summed up the discussion and put the question whether the Veterinary Investigation Officers should include this disease in their programmes of investigation work and should collect and forward to Mukteswar, information and material.

The proposal was approved unanimously.

The recommendation of the Committee that 'Goat pneumonia is of very grave importance and calls for a great deal of investigation in various centres and exchange of knowledge so obtained and its correlation to haemorrhagic septicaemia of cattle' was adopted.

***Natural outbreaks of rinderpest in sheep and goats and their bearing on the general problem of control of this disease** (Subject No. 2).*

Mr. Kerr (Bengal—Officiating Animal Husbandry Commissioner) introduced the recommendation of the Committee and said that goats and sheep were generally refractory to natural rinderpest infection but indications were that outbreaks did occur amongst these animals. There was evidence to show that infection could be transmitted by cattle to sheep and goats. As the subject was in the early stages of investigation the Committee was of the opinion that it should be actively pursued.

The recommendation of the Committee was accepted.

***Note on the methods to be adopted for the control of Johne's disease in India** (Subject No. 3.).*

Mr. Kerr (Bengal—Officiating Animal Husbandry Commissioner) in introducing the subject, said that investigation on this disease was being carried out in various parts of the country, particularly at the Imperial Veterinary Research Institute and in Mysore. He then read and explained the recommendations of the Committee, *viz.*, that—

1. 'Further investigation as to the incidence of the disease in the villages is necessary'.
2. 'The question of the disposal of positive reactors should form the subject of future discussions, as slaughter of such animals is impracticable'.
3. 'Diagnostic tests are at present not very reliable but the Double Intradermal test may be continued and it should always be confirmed by faecal examination'.

Mr. Achar (Mysore), said that Johne's disease assumed a position of major economic importance as it occurred in almost all dairies in India. The Mysore Veterinary Department undertook a survey in Bangalore and Mysore and found that the disease was prevalent in almost all the dairies. The important factor in this disease was the long incubation period. He therefore suggested certain measures which should be carried out as far as possible with a view to check the spread of this infection. Among others, he suggested isolation and destruction of the affected animals. He was confident that if there was sufficient propaganda about the economic importance of this disease, people would not be unwilling to destroy the positive reactors.

The other point on which he laid great emphasis was, that dairy owners, whenever they put up their animals for auction, should not sell animals which were suspected to be suffering from Johne's disease.

Mr. Shirlaw (Mukteswar) said that some years ago he had pointed out in connection with the control of anaerobic infections and Anthrax which accounted for considerable mortality in cattle that the first essential was to map out the enzootic areas. Observations and experiments in regard to these diseases had shown that there were certain enzootic areas, where from time to time the disease flared up, and these were responsible for epizootics. The same was true about Johne's disease. If it could be possible to wipe out the sources of infection and stop trade routes through these areas the trouble

could be mitigated and further centres of infection could be stopped. He said that this disease was already known in England and other countries and considerable work had already been done there on this subject. Research workers in India could rely on the experience gained elsewhere as the disease did not differ greatly from that met with in other countries. In his opinion the first thing to do was to spot the areas of infection and to clean them up. He appealed to the Veterinary Investigation Officers to send more information and material to Mukteswar for identification.

As the disease was not a peracute Septicaemic condition cases would not be always available for postmortem examination during the routine touring duties of these officers. It would, therefore, be advantageous if obvious clinical cases were marked out and attempt made, whenever possible, to carry out the postmortem and collection of the necessary material. He added that the morbid tissue required for examination was a piece, $\frac{1}{4}''$ in diameter, round the ileocaecal valve, preserved in 5 per cent. formalin. He said that on account of the climatic conditions it was rather difficult in this country to collect suitable material as by the time the Veterinary Investigation Officer reaches the spot, putrifaction sets in the carcase. Moreover, it was difficult to diagnose the disease in its initial stages, as the clinical manifestation, *e.g.*, emaciation, diorrhoea, etc., may be due to nutritional, parasitic or other causes.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that this matter was fully discussed at the Committee and expressed the view that Mysore was particularly in a better position to deal with this disease, and that the destruction of the affected animals was the correct method. But as these cattle could not be destroyed against public opinion, the method best suited to the tract should be employed.

He said that though the Mysore Veterinary Department had been successful in the detection of cases with Johnin, research workers were not unanimous about its superiority over Avian Tuberculin and therefore no recommendation was made on this subject. He further added that the Imperial Council of Agricultural Research had sent an officer for training in England and it was hoped that he would be able to tackle this problem more effectively.

Rai Sahib Ghose (*Assam*) advocated the use of mineral supplements, which he considered prevented Johne's infection.

The Chairman said that minerals in the food of cattle might act as an ameliorative but the point under discussion was as to how to control the disease.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that the question of the disposal of re-actors had better be left at its present stage. Though it is generally believed that animals receiving suitable mineral supplements, etc., are resistant, a number of these have been known to suffer from Johne's disease.

The Chairman enquired what steps were possible to prevent valuable milch herds from being infected by the purchase of stock from other farms which might not be even suspected.

Mr. Shirlaw (*Mukteswar*) said that the difficulty of the problem lay in the fact that incubation period of the Johne's disease was sometimes about 2½ years. It was a very slow and insidious type of infection. Animal which they had experimentally infected at the Imperial Veterinary Research Institute did not show any reaction to tuberculin test for a long time. He recommended the use of Glover's new Johnin and repeated direct faecal examinations, following a dose of croton oil.

Mr. Hurley (*Madras*) said that the statement on page 2 of the Committee's report regarding the material received at the Madras Veterinary College needed correction and should read as follows :—

> 'Mr. Hurley stated that material received at the Madras Veterinary College showed that at least 20 per cent. of the positive cases came from villages.'

The Chairman promised to have a correction charried out in the record.

Mr. Achar (*Mysore*) referring to the difficulty of the diagnosis of the disease as pointed out by Mr. Shirlaw, said that their experiments on goats revealed that the disease was transmissible to goats and would show itself in them within four months. This finding was particularly helpful as the diagnostic, prophylactic, and curative measures could now be tested on goats.

As regards the observations of the Chairman regarding the selection of animals from dairy farms, etc. Mr. Achar said that the animals should be selected from such places only where Johne's disease had not been known for a number of years previously.

As regards Rai Sahib Ghose's suggestion, Mr. Achar said that the use of minerals in cattle foods was now almost a routine practice amongst cultivators.

After this detailed discussion, the Board accepted the recommendations of the Committee.

Note on control of Doyle's (*Ranikhet*) *disease in India* (*Subject No. 4*).

Mr. Kerr (*Bengal.—Officiating Animal Husbandry Commissioner*) introduced the report of the Committee and said that this disease had been under investigation for many years in other countries but the results obtained so far had not been satisfactory. An officer from India had recently been deputed for training in the United Kingdom and would presently join the ranks of the Investigation Officers in this Country.

Mr. Malik (*Bihar*) said that he had not tried segregation of infected birds so far but more than 10 per cent. of their birds suffered from Doyle's disease and they were unable to suggest any preventive measures.

Mr. Shirlaw (*Mukteswar*) said that he looked upon this disease in India in the same way as foot-and-mouth disease in England. It appeared to him that the only method of controlling this disease in India was by wholesale destruction of the affected birds. As in the case of foot-and-mouth the carrier problem had to be considered and borne in mind. The recovered birds acted as carriers and proved a natural menace. In his opinion, therefore, stamping out of the

infection by prompt and whole-sale slaughter of affected birds was the only feasible method of control and vaccination was bound to prove a hopeless failure.

Mr. Bruen (*Bombay*) said that he was rather disappointed to see that apparently no action was being taken to ascertain how this disease was transmitted and how best to prevent it. His experience showed that it usually occurred a day or two after a *bazar* (mandi) was held in the villages. The other source of the spread of the disease was through railways and he was of the opinion that an investigation into the methods of transmisssion and spread of the disease, should be undertaken in the manner suggested by him two years ago.

[Mr. Crawford (Ceylon) was rather surprised to hear from Mr. Shirlaw that recovered birds acted as carriers and requested him to further amplify this point. If this was the case, the chances of getting rid of this disease were very remote indeed. He supported Mr. Bruen's remarks that a great deal of the disease was being spread by the railways. He knew many cases in which birds sent from one place to another though originally free of disease spread the infection after arrival at their destination.]

Sardar Bachan Singh (*Central Provinces*) pointed out that the suggestion regarding destruction of the affected birds for the control of outbreaks of Doyle's disease, would not be practical under field conditions and would make the field workers very unpopular in the villages.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that he had been in a village where the whole fowl population had been completely wiped out except one little flock which was never let out of a particular man's compound. In such a case it would be a great pity if the birds were to be destroyed. He pointed out that so far the Board had only considered control by means of vaccine but if the spread of disease could be effectively checked by segregation by means of wire-netting, etc., or some such simple method, it would be much better.

Sardar Bahadur Datar Singh (*Punjab*) said that although he was not a technical man he entirely agreed with Sardar Bachan Singh that the village conditions were such that if wholesale destruction of birds in areas affected with Doyle's disease were advocated, it would have a very bad effect.

Sardar Balbir Singh (*Mukteswar*) said that Mr. Shirlaw never advocated wholesale destruction but what he meant was that all those animals which were suffering should be destroyed and other fowls segregated. He added that it was a disease which has been the subject of research for many years in other countries. It has produced little positive results, but a vast array of negative information was collected. A special officer from India was under training in the United Kingdom and would shortly join the ranks of investigators in this country and it was hoped that his work would help to take them further in their knowledge of this disease. There was no need to be pessimistic about the results.

Mr. Shirlaw (*Mukteswar*) said that wholesale slaughter of birds was not proposed in the committee meeting. All they proposed was immediate

diagnosis and slaughter of diseased birds and thereafter to split up the flock in small groups and locate them apart from each other and employ rigorous disinfection measures. He had a personal experience of this method of control of Doyle's disease in the field near Lahore in the Punjab. A large number of enthusiastic poultry breeders had consulted him in regard to the control of this disease. On every occasion when this policy had been adopted the disease was restricted to few birds only and the owners were very happy over the results. He, therefore, felt that if this method was adopted carefully it would certainly yield good results. Further he said that the control of all poultry diseases was very largely facilitated by the constructions of proper poultry houses. That was an axiom of all poultry husbandry. He had sufficient experience to realise that under village conditions one could not hope to control poultry diseases. It was up to the Veterinary Investigation Officers and those who were interested in this problem to devise some simple method of housing these flocks so that (*a*) they were exposed to infection as little as possible, and (*b*) should a disease break out, provision could be made for its control by segregation of healthy birds from the affected ones.

[Finally for Mr. Crawford's information he explained in detail the results of the research work carried out at Mukteswar on this problem with special reference to the finding that carrier problem existed in the recovered animals.

The experiments had proved that birds did not contract the disease by contact but by drinking the contaminated water or eating the grains on which contaminated droppings had fallen. He advocated the use of Potassium Permanganate in the water as a disinfectant.]

Mr. Bruen (*Bombay*) narrated his experience in the Bombay Presidency and said that birds that were sent in most modern cages in the rail van contracted the disease on their journey and died two or three days after arrival at their destination, whereas the birds which were taken in first class compartments in the same way survived. He was therefore at a loss to understand where the infection came from and felt positive that it was transmitted in some other way than those stated at the Board. He therefore suggested that action should be taken at once to find out the cause of the disease and eradicate it.

Mr. Shirlaw (*Mukteswar*) said that this disease was in some ways comparable to foot-and-mouth disease and like it the virus involved was one of the strongest of filterable viruses which could reproduce the disease in dilutions ranging from 1 in 10 to 1 in 20 million. He narrated two instances in England where foot-and-mouth disease had broken out and veterinary inspectors were at a loss to locate the source of the outbreaks. In one instance the source of infection was attributed to hay which had been brought from an infected area. He was of the opinion that infection was spread by infected birds, grains, stream, etc. He further observed that human agency was also involved in the spread of the infection and cited an instance in England where foot and mouth infection had been spread among cattle in this manner. In conclusion Mr. Shirlaw observed that biological test was infallible and suggested that whenever any suspicion arose in regard to diagnosis, the case should be dealt with as that of Ranikhet disease and necessary precautions should be taken.

Mr. Garewal (*Punjab*) said that during the course of discussion no one had suggested the treatment for this disease. He requested the Board to lay down the lines of treatment.

Mr. Kerr (*Bengal,—Officiating Animal Husbandry Commissioner*) in summing up the debate said that the best method of eradicating the disease was the destruction of affected birds. He referred to the methods suggested by Messrs. Shirlaw and Bruen and said that the methods best suited to the locality should be broadcast to everybody so that steps might be taken to control the disease as far as possible.

At the request of Sardar Bahadur Datar Singh, Mr. Kerr promised that all the information available in regard to diagnosis prophylaxis, and treatment of the disease will be collected and made available to all interested through the Council's journal.

At the suggestion of *Mr. Badami* (*Hyderabad*) the words ' it must not be expected that he will promptly succeed in an investigation in which so many first-rate workers have not succeeded ' were omitted from the concluding portion of the committee's report and the words ' has been collected ' were added after ' vast array of negative information '.

The Chairman informed the Board that at the meeting of the Advisory Board held in November, 1937, it was pointed out that the Veterinary Investigation Officers had too many things to do and could not devote enough time to the study of poultry diseases. A recommendation was therefore sent round to all Provincial Governments that where adequate facilities existed, a special officer shold take up the investigation of poultry diseases. With that object in view, 5 Provincial Governments had come up with such schemes which had been discussed by the Advisory Board at their last meeting and recommended for sanction. These schemes would be placed before the Governing Body at their next meeting.

In reply to Mr. Malik, *Mr. Kerr* (*Bengal officiating Animal Husbandry Commissioner*) said that any new schemes on poultry diseases which reached the Council before the meeting of the Advisory Board to be held early in May would be considered at that meeting and if approved, would be placed before the Governing Body in July.

Mr. Shirlaw (*Mukteswar*) complained that even though they had been publishing the results of researches carried out at Mukteswar in the Council's journals and other bulletins, they received frequent queries of a very elementary character from various quarters. He said that the Mukteswar institute could not be expected to act as a propaganda bureau as well as a Research and advisory bureau.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said it takes considerable time for the results of research to reach the layman, even the Government practitioner. The students learnt first of all about these diseases and their control measures in the Colleges, then they become practitioners in cities and villages and thus after several years of practice, the knowledge about control measures spreads amongst the masses. He promised however that the Council will try, as far as possible to disseminate information through the Animal Husbandry Bureau to practitioners and workers in India, regarding the work being done at Mukteswar.

The Chairman said that the Research Council made a generous free issue of all its journals to provinces and States in order that both research workers and field workers might have easy access at least to the results of research since 1930 when the Council was established. He also drew attention to the fact that the abstracts published by the Imperial Bureau of Veterinary Science gave a good summary of recent veterinary researches in all countries. There was an appreciated free issue of these and the Council had also authorised all officers in charge of the I. C. A. R. schemes to debit the cost of Imperial Agricultural Bureaux publications to the grant. He endorsed the promise made by Mr. Kerr. There was really no reason why any veterinary worker should now be unaware of the results of recent research.

[*Mr. Crawford* (*Ceylon*) agreed with Mr. Bruen that even the runs suggested by Mr. Livingstone would not prevent the spread of Ranikhet disease as birds, *e.g.*, crows were responsible for the transmission of the disease from infected to healthy fowls. He suggested that whenever new fowls were purchased they should be isolated for say about a fortnight to see if they showed any signs of the disease.]

The concluding observations of the Committee as amended were finally recorded.

Note on the present position regarding the control of surra in horses and cattle in the Punjab (Subject No. 5).

Mr. Sen (*Mukteswar*) introduced the report of the Committee on parasitic diseases of Animals.

Recommendation (1) of the Committee, *viz.*,

> " That the investigation of bovine surra should be included as an item of special importance in future programme of work for the Veterinary Investigation Officers in India",

was accepted by the Board as it stood.

Regarding recommendation (2) *Mr. Malik* (*Bihar*) said that so far as bovines were concerned, Nagonol was expensive and unnecessary. He considered that Tartar-Emetic was very good and efficacious.

Sardar Balwant Singh (*Veterinary Investigation Officer, Bengal—nominated*) said that in the case of bovines, Bayer 205 and Tartar-Emetic were equally efficacious and in Bengal at any rate Nagonol was not used for the treatment of bovine surra.

Mr. Mahajan (*Hyderabad*) said that he had used Nagonol whenever there was an outbreak of this disease in bovines in Hyderabad but he found that it failed in acute stages. Later Tartar-Emetic was tried in such cases and it proved a great success. He therefore suggested that the recommendation must include the use of Tartar-Emetic in the case of bovines.

After further discussion recommendation (2) *viz.*—

> " That in view of the high cost of Nagonol, an investigation should be undertaken to explore the possibilities of less expensive drugs in the treatment of surra, and that, if necessary, efforts should be

made to secure the collaboration of one or more leading firms of chemists in this connection ",

was accepted.

Recommendation (3).

" That in the meantime the Bayer Company should be addressed concerning the possibility of reducing the price of Nagonol so as to bring the drug within the reach of the average stock-owner in this country ",

was also accepted as it stood.

Regarding recommendation (4), *Mr. R. K. Ram* (*Veterinary Investigation Officer, Bihar—nominated*) said that in 1924-25 investigations were carried out by him under Dr. Edwards to determine the minimum effective dose of Nagonol in the prophylactic treatment of equine surra, and a conclusion was arrived at that one gram per 1,000 lb. body weight proved effective for 15 days. He did not think it necessary to undertake work on this item.

Mr. Sen (*Mukteswar*) pointed out that no records were forthcoming to prove that this work was done and results reported by Mr. Ram had been arrived at.

Mr. Shirlaw (*Mukteswar*) said that taking the price of Nagonol at Rs. 5-8-0 per gram, the cost of treatment of one horse would work out to Rs. 48 to spend which on such horses as were found in the districts was absurd. He thought, therefore, that they could not afford to use that drug very much in this country save in the case of few selected or Government owned animals.

It certainly could not be used in the districts.

After further discussion the recommendation of the Committee

" That a series of intensive investigations should be undertaken to determine (*a*) the minimum effective dose of Nagonol in the prophylactic treatment of equine surra ; (*b*) the relative therapeutic value of Naganol alone and Naganol cum Tartar-Emetic method in the treatment of both acute and chronic cases of this condition ",

was put to vote and was adopted.

Mr. Kerr (*Bengal—officiating Animal Husbandry Commissioner*) introduced recommendation No. (5) of the Committee on the subject which reads as follows :—

" That in those areas where surra is prevalent, arthropod surveys should be undertaken, in collaboration with the Mukteswar Institute, with a view to formulating a working hypothesis concerning the species of vectors involved in the spread of the disease and that, in the meantime, measures should be taken in selected surra areas for the destruction of the eggclusters of Tabanids, which are now known to be the most common vectors of the disease."

Mr. Richards (*United Provinces*) said that the recommendation was not properly worded. He took exception to the use of the word " arthropod " and also to the wording " with a view to formulating a working hypothesis."

He said that what was wanted was a knowledge about the vectors which were responsible for the disease. He suggested a rewording of the recommendation as follows :—

> " In those areas where surra is revalent surveys should be undertaken in collaboration with the Mukteswar Institute on the biting insects and ticks with a view to determining the species of vectors involved in the spread of the disease."

Mr. Shirlaw (*Mukteswar*) said that he entirely agreed with Mr. Richards and said that what was wanted was the determination of the insects and ticks which acted as vectors of surra. He then explained the experiments carried out at the Muktesar Instutute and pointed out some of the anomalies in the work carried out by cross in 1910.

Mr. Sen (*Mukteswar*) answered the points raised by Mr. Richards and said that the terminology used in the recommendation was in accordance with the veterinary and medical practice. He therefore suggested to the Board that the recommendation might be approved as it was.

Mr. Hurley (*Madras*) suggested that for the word ' known ' in the last line of the recommendation the word ' believe ' might be substituted.

The Chairman suggested that in order to meet the views expressed the recommendation mught be worded as follows :—

> " That in those areas where surra is prevalent, surveys should be undertaken in collaboration with the Mukteswar Institute, on the likely blood-sucking arthropods with a view to ascertaining the species of the vectors involved in the spread of the disease. In the meantime, measures should be taken, in selected surra areas, for the destruction of the egg clusters of Tabanids, which are believed to be common vectors of the disease."

This recommendation in this form was adopted by the Board.

A review of the present position in regard to Theileriasis of cattle in India (*Subject No. 6 of the agenda*).

Mr. Sen (*Mikteswar*) introduced the recommendations of the Committee and by way of preface said that in theileriasis of acute form was not frequently encountered in India although the mild form was very prevalent. There were four species of Theileria which were responsible for this condition and the worst form, *viz.*, East coast fever, was prevalent in Kenya and certain other ports of Africa. He said that the Kenya Veterinary authorities were willing to assist the Mukteswar Institute in this investigation but as it was not desirable to risk the importation of East coast fever blood and thus the spread of this serious trouble in this country, it was proposed to send the material available in India for investigation and cross immunity tests in Kenya.

Dr. Ray (*Mukteswar*) said that this disease was not known in India till 1925, when Dr. Edwards instituted investigation on the material available from imported cows in Lahore and Allahabad. It was now found that this disease was prevalent to some extent. He said that the drugs they had used so far had failed as curatives and Bayer's product Atebrin was partially successful. As this disease in the intralencocytic habit of its causal parasite, resembled

to some extent Kalaazar in human beings, experiments were being conducted to see whether the medicines which were effective in Kalaazar would not prove efficacious for this trouble as well.

The first recommendation of the Committee on this subject which was introduced by Mr. Kerr was approved by the Board.

After some discussion, the second recommendation of the Board which was amended as follows was also approved :—

> " There is need for a series of controlled cross-immunity tests to determine the relationship between East Coast Fever and acute forms of theileriasis in India but that these tests should be carried out in a locality where East Coast Fever is definitely known to be prevalent ".

Mr. Sayer (*Imperial Agricultural Research Institute*) suggested that in the third line of recommendation (3) the word ' members ' should be replaced by ' compounds '. This was accepted and the recommendation was approved.

(The Board rose at 1-10 P.M. to resume at 2-30 after lunch.)

Before the Board resumed their deliberations, the Chairman announced that the sad news of the death of His Excellency Lord Brabourne Governor of Bengal had just been received. The following resolution was passed in silence, all members standing for two minutes :—

> " The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India desires to record its deep sorrow at the death of His Excellency Lord Brabourne who, as Governor of Bombay, Governor of Bengal, and as Viceroy and Acting Governor-General, took so deep and practical an interest in the improvement of Animal Husbandry in India. It respectfully tenders to the Lady Brabourne its sympathy in her bereavement."

The application of the results so far obtained in the enquiry on the bionomics of the Warble Fly for the control of this pest (*Subject No. 7*).

In introducing the report of the committee *Mr. Sen* (*Mukteswar*) said that it was generally argued that a good deal of information in regard to warble fly was already available as a result of investigations in other countries and that there was therefore little room for work on this subject in India. He was, however, of the opinion that in the present case that argument did not apply, for that aspect of bionomics which was being dealt with in India related almost exclusively to the regional distribution and seasonal prevalence of the pest. This varied from country to country and from province to province. It would not be urged therefore that the lines adopted in the present investigation were not sufficiently rational.

Mr. Kerr (*Bengal—Offciating Animal Husbandry Commissioner*) read the resolution of the Committee.

Mr. Richards (*United Provinces*) said that for the widespread control of the warble fly pest it was necessary to have all possible information upon the localities in which it was prevalent and suggested that in addition to the

evidence from cattle breeding farms, information should be available from hide grading and flaying schemes and that close touch should be maintained with the hide merchants as they were in the best position to know as to where the hides came from and might possibly be induced to submit regular returns about the incidence of warble fly. As regards the treatment, although it was known that tobaccolime dressing was effective it was not known what proportion of nicotine was required in the dressing. The entomological aspect required further examination with a view to standardising tobacco-lime mixture which would be most effective and at the same time cheapest. This work should be linked with the scheme which is being financed by the Council for investigating indigenous insecticidal plants. While experimental work for the control of this pest is in progress, all promising indigenous plant insecticides which are brought to light as a result of research schemes or from the work being done at the Forest Research Institute should also be utilised in these experiments.

Mr. Sen (*Mukteswar*) while having no objection to add this recommendation to the report of the committee, said that they were already in very intimate touch with the hide graders and hide dealers at some important centres. As regards the standardisation of lime-tobacco dressings, he observed that these ha already been throughly standardised as a result of very exhaustive work carried out on warble fly by the ministry of Agriculture in England. He did not anticipate any fundamental difference between the insecticidal value of the indigenous and foreign drugs. For instance, the measures that were adopted in England for controlling helminths were also applicable in this country. He said that Derries plant was effective against warble fly and if its cultvation could be extended in India, the problem of warble fly control would be substantially solved. He added that 4 lbs. of tobacco, one lb. of lime and one gallon of water was considered a very deffective ratio.

Mr. Mankar (*Bombay*) said that good results had been obtained at Hissar with tobacco and lime in the ratio of 50 : 50 and most of the animals were cured with that treatment.

The Chairman said that the Forest Research Institute at Dehra Dun was working on the rotenone—containing insecticides and the results were likely to be very valuable. Work was also in progress at Mysore, where a scheme had been financed by the Council, on the indigenous insecticides commonly called fish poisons. On the other point raised by Mr. Richards, he asked Mr. Livingstone to say a few words. He thought that though Mr. Sen was already in touch with marketing staff it might be possible to get regular records which would be more valuable than the occasional records which Mr. Sen was able to obtain up to the present.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that at present records were kept only of the hides thrown out for flays marks. He accepted Mr. Richard's suggestion and said that a record of warbled hides and the locality from which they came would also be maintained in future and submitted to Mr. Sen regularly. Finally he said that there was a tremendous amount of stems and strips from cigarette leaf samples of which could be sent to the Imperial Agricultural Research Institute for carrying out experiments. Rao Bahadur Viswanath agreed to do this at his Institute.

It was agreed that an enquiry be made from the Forest Research Institute, Dehra Dun and the officer-in-charge at Mysore as to how far they had proceeded with the work on insecticides.

In regard to the Warble Fly of the goat, the Board approved the recommendation of the Committee.

Mr. Sen (*Mukteswar*) then explained the recommendation of the committee and supplied statistical information regarding the extent of damage caused by ticks to hides in India.

The Chairman said that it was realised that the damage caused by ticks was very great but he would like to know on what lines more research was required. He added that sometime ago funds were allocated by the Research Council for a practical tick-control scheme in the Bombay Presidency.

Mr. Sen (*Mukteswar*) said that the Bombay scheme was concerned particularly with certain species of ticks which were not of common occurrence in localities in Northern India. He considered it necessary to find out (1) in which stage the tick did the damage ; (2) which was the season in which most damage was done ; and (3) which were the species involved.

Mr. Naik (*Veterinary Investigation officer, Bombay—nominated*) said that research on some of the points raised by Mr. Sen had already been included in the Bombay scheme and if investigation was required on any more points it could be included in that scheme provided funds were also increased.

Mr. Richards (*United Provinces*) said that it was perhaps a little premature to ask the Animal Husbandry Wing to make a recommendation on a matter on which there was no note and which apparently required further enquiry and possibly further preliminary small scale investigation before launching out into the preparation of a scheme. He felt that the Advisory Board, Imperial Council of Agricultural Research before accepting a scheme, would certainly like to have a good deal more information than was at present available and it would save time in the long run if this information were collected and further preliminary work carried out before putting up an extensive scheme. He added that it had certainly been shown by Mr. Sen that ticks did cause severe damage and information was also furnished by him in regard to the monetary loss resulting due to skins damaged by ticks. Apart from the extent of the damage, the points which in his opinion required investigation, were (1) what ticks did the damage, and (2) at what stage. This seemed to be a matter which could be determined by a comparatively small scale experiment.

The Chairman suggested that in view of the points raised during the discussion on this subject the best thing would be to make a general recommendation stating that ' the Board was greatly impressed by damage caused to hides by ticks in India and recommended that the question of further research should be considered by the Imperial Council of Agriculture Research '. If this was accepted, the matter would be placed before the Entomological Committee for consideration.

Mr. Livingstone (*Agricultural Marketing Adviser—nominated*) said that it would very much help the buyers of raw skins and raw hides if a survey could be

carried out simultaneously to find out the centres of infection and periodicity. There was lot of information ready on the subject if it could only be collected.

Mr. Egan (*United Provinces*) said that in connection with the export of skins to America, he was taken round last winter to some of the buying stations in Cawnpore and was shown lots of skins that had been damaged by ticks. The local buyers told him that the damaged stuff mostly came from the districts of Oudh, particularly during autumn and early winter. He supported the recommendation and aded that it was a problem which should be taken up seriously as there was a tremendous loss to the trade on this score.

After further discussion the *Chairman* suggested that the following recommendation would cover the views expressed.

> " The Board is greatly impressed by the damage caused to hides by ticks in India and recommends that the Imperial Council of Agricultural Research take up the question of further research with special reference to distribution, periodicity and the stage of the tick when damage is caused ."

This was unanimously adopted.

Development of pedigree registration and milk recording (*Subject No. 8*).

In introducing the report of the Cattle Breeding Committee and Dairying Committee *Mr. Sayer* (*Imperial Agricultural Research Institute*) said that they were much impressed with the enormous importance of pedigree registration and milk recording as in the development of dairy breeds it was very difficult to visualise the extent to which progress has to be made before the country was in line with countries like Denmark where everything was practically developed to this end. In India, we had not even in the majority of cases reached a stage where we could say that we had been weaning the calves, and any system of milk recording, when taken in comparision with other countries, was going to be very difficult because this question of the calf's share was always a very debatable point. The Committee therefore merely recorded the importance of the work so far done and recommended that all assistance should be given to Societies who were establishing milk collecting centres and were contributing to the encouragement of milk recording.

As regards pedigree registration Mr. Sayer said that the only way of getting pedigree registration recognised in this country was to make the actual breeders feel that they would get increased price for their registered pedigree stock.

Mr. Kartha (*nominated*) said that in his note on pedigree registration and milk recording he had outlined briefly the general course of development of pedigree registration and milk recording and also tried to describe the important role which this work had played in the improvement of cattle and milk production in the different countries of the world which had been successful in the development of their livestock. The various uses and advantages of pedigree registration and milk recording to breeders, dairymen, buyers, sellers, students, investigators and those concerned with the study of animal genetics had been enumerated. He had also described br efly the work done in India and what the Council had done to encourage milk recording and to co-ordinate work done in this country. A suggestion was made that this work might be

developed through the organisation of milk collecting centres. Emphasis had been laid on the necessity for unformity and for the co-ordination of this work in order to facilitate comparison of record of different countries. He pointed out that there was a potential market for Indian cattle in other countries, and unless the work in India developed on international lines and the regulations laid down in the International Conventions on this subject were observed it is unlikely that Indian Records would be accepted in other countries or the value of her animals correctly assessed and appreciated.

Mr. Khurody (*Marketing Officer—nominated*) said that in the milk marketing surveys they had felt considerable difficulties in determining the annual milk yield of various cattle as practically no record were available. Out of several million milch cattle in this country records of only about 15,000 cattle were available. Of these nearly 5,000 were from military dairy farms and the rest were in private and civil farms. This number comprised about 0·01 per cent. only of the milch stock in this country. In the absence of records, therefore, it was extremely difficult to furnish any reliable data regarding the milk producing quality of Indian cattle and anything that could be done to satisfy this want would be of immense use to the industry as a whole.

Sardar Bahadur Datar Singh (*Punjab*) also stressed the extreme importance of this work. In India whenever one selected a milch cow or a buffalo, he got her milked in his presence say twice or three times. This was, however, no test at all as in certain cases soon after the milking period there followed a long dry period which meant disaster to the cattle breeder. He added that milk recording could not be satisfactorily done unless the calves were weaned but he realised that there were many difficulties in the way of adopting the weaning system. He was of the opinion that at least a start, however humble, should be made in this direction. If the cultivators got the impression that by keeping such records, they got more return for their cattle, the recording system would become a success.

The report of the committee was adopted.

Organisation of the supply of breeding bulls with special reference to His Excellency the Viceroy's Gift Bull Schemes (*Subject No. 9*).

In introducing the report of the Committee, *Mr. Sayer* (*Imperial Agricultural Research Institute*) said that it was becoming more and more apparent that the cost of rearing a good dairy bull in villages was getting beyond the means of an average villager. He could not bring a good dairy bull up to his prime as the cost came up to about 350. The feeling of the Committee was that a good bull could not be sold for that amount. It was therefore quite clear that in order to get dairy bulls of recognised breeds reared upto maturity, some assistance was essentially called for and the Committee had therefore recommended that all agencies which could, in the opinion of the Livestock Department, be profitably employed on this work should be subsidised. The Committee were also of the opinion that all possible agencies should be employed to facilitate the production of pedigree bulls for milch and draught, and draught only.

Narrating his experience in the Bombay Presidency, *Mr. Bruen* (*Bombay*) said that they had several commercial dairies in the Presidency. He had repeatedly tried to induce these people to rear good bulls but they always

wished to have a guarantee that Government would purchase the mature bull at a specified price. He agreed with Mr. Sayer that unless the breeders were subsidised by Government, there was no likelihood of getting good bulls. In the case of milch and draught, and draught breeds there was another difficulty. No two bulls over 3 years of age could live happily together so that the Cultivator had to engage extra labour to rear more than one bull. This they could not do without a subsidy. In Gujarat tract every village was producing Kankrej cattle but no breeder would keep the bulls and calves beyond six months of age because of the difficulty of keeping two or more bulls together. These young bulls were therefore castrated at a young age and were lost as breeding bulls. He added that if these young bulls were to be reared, they should either be taken on Government farms or a subsidy provided for rearing them. Rearing at a Government farm would be very costly.

In the case of draught breeds in the Bombay Presidency the breeder or the owner of a cow usually got rid of his calf as soon as it was weaned but in the purely draught breeds no body castrated them until about 4½ years of age. The cultivators who had their own lands bought these young bulls and reared them up with a view to selling them as draught cattle. These animals must be stopped from going into the plough and the only way of doing this was to subsidise. Bull production in England was entirely different from that in India. In other parts of the world a dairy farmer who attempted to rear more than one or two bulls got about 300 to 400 pounds for a good bull but in India a good bull could not be sold even at cost price.

Mr. Read (*Punjab*) said that there were 1,700 young bulls at Hissar, between the age of 6 months and 2½ years, living together perfectly happily. In the case of mature bulls also there was seldom any fight.

Mr. Garewal (*Punjab*) said that breeders in the Hariana, Dhani and Montgomery tracts in the Punjab always kept their young bulls together but it was never heard that any trouble had ever been experienced.

Sardar Bahadur Datar Singh (*Punjab*) agreed with Mr. Bruen that an ordinary private breeder could not afford to rear bulls because it was very expensive. This he supported with his personal experience at his farm. The general tendency therefore was to dispose off the animal when it started drinking milk. Regarding the other point he said that so far as Hariana breed, which was not very docile, was concerned, bulls of all ages were kept together and there had never been any fight between them. This was also the case with Montgomery and other Punjab breeds.

While supporting the recommendtion of the committee *Mr. Manka* (*Bombay*) stated that there was great possibility of utilising the institutions like Gowshalas and Pinjrapoles for this purpose. In the Province of Bombay several Gowshalas were doing very good work but only one or two had yet been subsidised by Government. With such a recommendation from the Animal Husbandry Wing, the work of Gowshalas would be much more appreciated.

After this detailed discussion the Board approved the following recommendations of the Committee on this subject.

1. They recognised the difficulties and expense attendant on rearing good dairy bulls and recommended that all agencies which could

in the opinion of the Livestock Department, be profitably employed on this work should be subsidised,

2. They were also of the opinion that all possible agencies should be employed to facilitate the production of pedigree bulls for milch and draught, and draught only.

Mr. Wynne Sayer (*Imperial Agricultural Research Insitutute*) then introduced recommendation (3) of the committee on this subject and said that in connection with the Viceroy's Gift Bull Scheme he had received requisitions for Sahiwal bulls from some persons in Bengal. When asked what they were wanted for, the reply was that they wanted to donate a really good bull for the money they were subscribing to the livestock improvement scheme. It was obvious that there was non-official agency doing something which it thought was good but which was obviously quite contrary to the policy of the Livestock Department. It was quite clear, therefore, that a lot of harm could be done by indiscriminate presentation of bulls which were possibly unsuitable for the cattle of the locality and for that reason this recommendation was made by the committee. He strongly urged that the recommendation should be supported by the board in view of a good deal of waste and a lot of misguided effort.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) supported the resolution saying that in Bengal they had encountered the same difficulty and were embarrassed on several occasions due to the donation of a bull totally unsuited to the locality. It was, therefore, made a condition that donors of these bulls must consult the livestsock officer of the district and get his approval for the bull to be donated in a particular locality. In quite a number of cases donors complied with the request and presented money through the livestock department for the purchase of bulls, but some times this money was accompanied by a request, that the bull purchased should be located in a particular place and to this they agreed, provided the people of that place agreed to (1) maintain the bull; and (2) castrate all the scrub bulls in the area where the approved bull was to serve. But if the bull was considered unsuitable for a a locality the donor was informed and if he did not agree to take the advice of the Livestock Officer, the gift animal was returned. Although it seemed a very difficult problem it could be solved with a bit of tact and patience.

Mr. Bruen (*Bombay*) said that there were some practical difficulties in this matter. In the Bombay presidency premium bull system was in practice. In response to H. E.'s appeal certain donors wanted their bulls to be located in a particular area which happened to be a locality to which premium bulls, had not been issued. As a result of this a man in the nearby village who possessed a premium bull complained that he had been taking a bull and paying for it while others were getting free bulls. This obviously spread discontent. Finally he said that if the wording of the recommendation could be altered in some way a good deal of valuable work could be done under this scheme.

The Chairman read out some important extracts from His Excellency's appeal and pointed out that the weaknesses now pointed out did not occur in the scheme as originally framed.

After further discussion recommenation (3) of the Committee was accepted in the following form .—

> " To avoid indiscriminate location of bulls, the Animal Husbandry Wing is of the opinion that all donors under the Viceroy's Gift Bull Scheme should be informed that the selection and location of bulls purchased from such donations should be controlled by the Livestock Department or by the Cattle Improvement Society where such exists."

Formation of breed societies and other lines to be adopted for the improvement of milch cattle and buffaloes (Subject No. 10)

Mr. Sayer (Imperial Agriultural Research Institute) in introducing the recommendation of the Committee said that the object of a breed Society, which was entirely to place the control of a breed in the actual hands of the breeders, was so well known that it was hardly necessary for him to emphasize its importance. He was glad to say that the Sahiwal Breed Society had been started and he hoped that it would be the fore-runner of a good many more. When such Societies would be formed throughout India they would open up avenues for the disposal of stock and would directly communicate with the actual breeders. He recognised the favourable circumstances in which the Sahiwal breed was placed and also the fortunate position in having six breeders who were able to meet and pay for their own expenses. However, it would be found that in many cases breeders were so poor that they would be unable to undertake journeys to meet together and it was felt that in order to give every breed a chance to do what had been done in regard to the Sahiwal breed a small subsidy from Government might be essential for some years after the breed Society had been formed. Finally he explained the advantages of Breed Societies, quoting examples of the present condition of the Breed Societies in England as compared with their poor beginning.

The recommendation of the Committee that—

> " The Committee felt that if Herd Books and registration of Indian breeds of cattle were to be made a success, it was essential that *breed societies* should be formed to work in the interests of breeders. At the same time the Committee recognised the fact that owing to the circumstances of the breeders Government assistance and a small subsidy would be essential for some years after the breed society was formed",

was accepted.

The necessity for defining the breed characteristics of certain types of cattle exhibited under breed names [Subject 10 No. (a)].

In introducing the report of the Committee, *Mr. Sayer (Imperial Agricultural Research Institute)*. said that from the experience gained at the last All-India Cattle Show, it was quite evident that this resolution of the Committee was very necessary. At the last Show they had no classes for numerous breeds which were said to exist in various States and districts. When the animals were paraded together, it was in many cases very difficult to find out where one breed began and the other disappeared. This year too, in many cases, it had

been necessary to turn out of the ring, before judging some animals which were obviously in the wrong class. Under these circumstances, it was no use encouraging breeders to send up to the Show a breed which was called one thing by them and another thing by somebody else, and it was essential that a clear cut distinction must be made in regard to these breeds. He added that the only fair way of solving this difficulty was to set up a committee of experts of long experience of cattle in India, to convene these breeds and make recommendations. They should provide photographs and if possible measurements to explain all the typical animals.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) agreeing with Mr. Sayer said that he had experienced great difficulty at the Cattle Show in recognising particular breeds. Even the Judges at the show admitted that it was a difficult problem requiring very careful examination. Some of the cattle brought from districts were so wrongly classified that they could not be included in that particular breed and compete with the other animals. The situation required prompt clarification and the members of the proposed committee were really good selections. They had spent their lives in this kind of work and the areas in which these three officers had worked and had intimate knowledge covered a vast tract in this country and at any rate covered the areas in which these indeterminate breeds existed. The reason why he wanted the committee to take up this work urgently was that these officers were due to retire.

Sardar Bahadur Datar Singh (*Punjab*) said that although it was not customary to differ from the conclusions arrived at a meeting where the dissentient member was also present, he had obtained permission of the Chairman of the Committee to express his opinion in the full Board. He said that the officers proposed for this Committee, were likely to get extension on account of their excellent past work. He was under the impression that their valuable services and experience would be available without incurring any extra expenditure but he was surprised to learn that it was proposed to take up the work after they had retired.

The Chairman enquired from Sardar Bahadur Datar Singh if he had any suggestions to offer as to how the problem of defining breed characters of these cattle should be tackled.

Sardar Bahadur Datar Singh (*Punjab*) suggested that it should be done on the same lines as was done in the case of milch breeds. The red Sindhi, Sahiwal, Tharparkar and Hariana were milch breeds of all-India importance and the Council was justified in incurring the expenditure but the breeds which it was now proposed to define were either local breeds or at most were found in one or two provinces and States. The proposed scheme, therefore, was in his opinion not a justifiable charge on Council's funds.

The Chairman said that the condition laid down by the Governing Body was that the scheme must be of more than provincial importance.

On enquiry from the Chairman whether he agreed that this work ought to be done, *Sardar Bahadur Datar Singh* (*Punjab*) said that it ought to be done but he did not agree that the Council should spend much on this work.

Mr. Shirlaw (*Mukteswar*) said that Colonel Sir Arthur Olver's note on some common breeds of Indian cattle had aroused some interest. His (Mr. Shirlaw's) wife who was also interested in this problem was of the opinion that these breeds could never be put on proper footing unless some research was done on the origin of the cattle found in various tracts of India. Her opinion on Colonel Olver's historical observations concerning the origin of these cattle did not tally with that of the author. In his opinion the final classification of these breeds would depend on the original sources from which these cattle had emanated.

The Chairman said that he was in rather a difficult position because he could not commit the Council in any way to a scheme involving expenditure, till the detailed schemes had been examined by the Advisory Board and sanctioned by the Governing Body. He suggested that the recommendation of the Animal Husbandry Wing be made in general terms, *viz.*, that the Imperial Council of Agricultural Research should devise means for the definition of the breed characteristics of these breeds.

Mr. Warner (*Allahabad Agricultural Institute—nominated*) also recognised the difficulty experienced in defining a particular breed. He said that he had heard that last year one of the breeds was deliberately placed under another name to avoid competition.

Mr. Badami (*Hyderabad*) was anxious that this work should be expedited otherwise the same difficulty would be experienced at the next Show.

Mr. Garewal (*Punjab*) also complained that the same breed was now being exhibited under different names in different areas. Similarly different breeds came up from different places under one name. The definition of breed characteristics was therefore very urgent.

Mr. Richards (*United Provinces*) said that the recommendation of the Committee restricted the classification to grey breeds only but the recommendation should be such as to cover all the breeds.

Sardar Balwant Singh (*Veterinary Investigation officer—Bengal—nominated*) said that in Calcutta there was a demand for good cows and people asked for literature which would give the breed characteristics of the animal which they were to purchase. He therefore said that if the breed characteristics of the cows could be determined, there would be a good market for the cows in Calcutta.

Mr. Bruen (*Bombay*) said that in the recent all India Cattle Show a competor had entered his bulls in the class for the Rath breed whereas they were actually of the Mewati breed and he realised the mistake at the Show. He then wanted to enter his animals in the proper class but could not do so at the last moment.

The Chairman then put the following recommendation to the Board :—

> " The Board has observed that a large number of grey breeds of cattle has not yet been classified by definite breed characteristics. They recommend that the Imperial Council of Agricultural Research be asked to devise means for defining the breed characteristics of these breeds. Further the Board considered that it

would be advantageous if final selections of these types could be shown at the All-India Cattle Show at the end of the enquiry."

This was accepted by the Board.

Present position in India with regard to salvage of dry city milch-stock and supply of milk to large cities. (Subject No. 11).

Mr. Sayer (Imperial Agricultural Research Institute) introduced the subject and said that the Committee discussed the matter very fully and made the recommendation that was now before the Board for approval. He added that this question had become a hardy annual and the passing of resolutions was not likely to solve the problem and the Committee therefore thought that a small committee should be appointed which should visit these places and ascertain the facts at first hand with the help of local authorities and devise suitable measures. He was of the opinion that the Public Health authorities would sooner or later prohibit the maintenance of cattle sheds within city limits and this would go a long way to solve the problem.

Mr. Keventer (Nominated) said that the cows that were taken to Calcutta from Rohtak and Hissar were repeatedly put to a bull but they failed to calve. He said that the cost of sending the cow back to Punjab and to maintain it till it calved and then to bring it back to Calcutta was prohibitive. It was not therefore, profitable to send the cow back to its home after it became dry. The only solution of this problem was to locate the cow byres outside the city area and to rail the milk to cities. The obstacle against this was vested interest in the big cities.

The Chairman remarked that this was really a matter that Municipal Corporation should take up and make bye-laws which would encourage the establishment of cow sheds at places outside the city.

Mr. Bruen (Bombay) said that seven years ago he had worked a scheme for the location of dairies outside the city of Bombay but this had not materialised. He said that he bought 18 buffaloes and 12 cows from the cow sheds in the Bombay city and transferred them to a farm outside the city. All these animals came in calf and the project proved a paying proposition. Another somewhat similar attempt however proved a failure. He stated that the main obstacles against this plan were the landlords in the city of Bombay who derived huge sums as rents from cow sheds and who were on the Municipal Corporation as Councillors. These people would not be willing to lose this money and allow the cow sheds to be removed from the city area.

Another important point to contend with in Bombay was that consumers wanted fresh supply of milk at all odd hours of the day. So much so that the gowalas had to supply milk during every hour in the day and the cows and buffaloes had to be milked about nine or ten times in the day. This practice hampered the transport of milk from outside the city area.

Sardar Bahadur Datar Singh (Punjab) narrated his experience in Simla in connection with salvage of dry cows after the season was over. He said that a company was formed with a capital of Rs. 10,000 and the Nalagarh State had provided the company with grazing land on a nominal rent. The whole scheme failed as the dry cows did not calve.

Mr. Kerr (*Bengal—Officiating Animal Husbandry Commissioner*) said that there were good many points of similarity in the problem as it existed in Bombay and Calcutta and it was the vested interests which would not agree to the exclusion of commercial dairies within city limits. Another difficulty that had to be surmounted was that for miles around the city there was no suitable place for locating a commercial dairy. He said that the city dairymen were compelled to adulterate milk on account of the high rates and taxes. The rules relating to adulteration of foodstuffs were not strictly enforced.

He agreed with the committee's resolution for the appointment of a small committee to visit the three Presidency towns. The advice of this Committee might carry more weight with the local Government than the advice of the local officers. He said that the visiting committee might co-opt some officers of the Local Government and some members of the Municipal Corporation and the Government Livestock Expert. He narrated the history of a committee that was appointed in Bengal and its failure to arrive at any definite result.

Mr. Hurley (*Madras*) said that about 85 per cent. of the milk consumed in Madras was produced in the city and that only 15 per cent. was brought from outside. The number of cows slaughtered every year was rather high. Due to the granting of concession by the Railway Company in Madras the transport of cows from the city to the mofussil had considerably increased. For the 12 months prior to the introduction of the concession the number of cows transported was 664, whereas for the 12 months after the introduction of the concession it was 2,287, and along with it the number of cows slaughtered in the city was also considerably less. He was of the opinion that the best solution of the problem was to locate the dairies outside city limits.

Mr. Mankar (*Bombay*) said that the outlook in the Bombay city was much hopeful than in other cities. He said that in 1934-35 the B.. B. & C. I. Railway granted 25 per cent. concession in the transport of dry cattle and as a result some 3,000 more cattle were transported. The Bombay Humanitarian League purchased and distributed to the villagers about 1,000 cattle every year and later on these animals proved useful. Recently a scheme had been initiated in collaboration with the Baroda Government where a co-operative society had been started in Mehsana District and the cultivators who were members of the society purchased dry cattle from Bombay. There was a great demand in the Mehsana district for these dry cattle from Bombay. This problem could be solved if the railways granted concession for the transport of dry cattle and if a restriction could be placed on the slaughter of useful milch cattle. He said that this proposed committee should also co-opt members of the Corporation and representatives of the railway.

Mr. Badami (*Hyderabad*) said that several people from Hyderabad went to Bombay and purchased these dry cattle for Rs. 30 to Rs. 50. He suggested that a register should be maintained in the slaughter houses to show the number of animals slaughtered and the class to which they belonged. This he said would show the number of cows that had been slaughtered.

Mr. Kerr (*Bengal officiating Animal Husbandry Commissioner*) said that in Calcutta the minicipal slaughter houses maintained records of the animals slaughtered and in his opinion some good cows were also slaughtered.

Mr. Mankar said that according to the statement of the Superintendent of Slaughter Houses in Bombay some 40 per cent. of the cows slaughterd were definitely useful.

Sardar Balwant Singh (*Veterinary Investigation Officer, Bengal—nominated*) said that he assisted Mr. Kerr in the purchase of the Viceroy's gift cows and he knew what the position in Calcutta was. Thereafter he again visited the cow sheds for purchase of cows for other persons. The gowalas however refused to render any assistance in this connection.

The following recommendation of the committee was unanimously accepted :—

> " After a detailed discussion on the problem of salvage of dry milch cattle from cities, the Committee observed with regret that no effective action had so far been taken on the previous recommendations made by the Committee which dealt with this subject in 1937 and felt that no useful purpose could be served by further reiterations and resolutions along these lines. In view of the urgency and importance of the matter, they considered that a special small committee of people, closely associated with the subject, should be appointed to investigate the question on the spot at the three Presidency towns and endeavour to elucidate a course of action which would be assented to and co-operated in by the authorities concerned."

Mr. Kerr (*Bengal officiating Animal Husbandry Commissioner*) said that with the closing of the third meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India Sir Bryce Burt's association with the work of the Board was also coming to a close. Sir Bryce had guided two meetings of this Wing with great ability on account of his memory and his knowledge of the various subjects with which the Board had to deal. He was gratified to note that during the chairmanship of Sir Bryce Burt the old controversy between the Agricultural and Veterinary Officers had faded into obscurity. He wished Sir Bryce happiness and a long life.

Dr. Burns (*Agricultural Commissioner*) said that he and Sir Bryce Burt came out to India in the same year, *viz.*, 1908. Sir Bryce came to India after having been Lecturer in Chemistry at the Liverpool University and Assistant Agricultural Chemist and Lecturer at the College of Tropical Agriculture, Trinidad. In his career of 37 years of service, Sir Bryce had spent 31 years in India and Dr. Burns was of the opinion that there were few people who had so deeply influenced Indian agriculture in so many ways. He then referred to the various offices held by Sir Bryce Burt and said that those posts required great administrative ability and tact. He said that Sir Bryce Burt would always have the good will and gratitude of every member of the Board.

Mr. Richards (*United Provinces*) said that the officers and staff of the United Provinces Agricultural Department were proud of their connection with Sir Bryce Burt and that he carried into his retirement the good wishes of the members of the U. P. Agricultural Department. Sir Bryce Burt's interest from the outset had been that of the agriculturists and he had been a great friend of the agriculturists. He wished him in his retirement a long and happy life which he was certain would not be an idle one.

Mr. Badami (*Hyderabad*) associated himself with the remarks of the previous speakers and wished Sir Bryce and Lady Burt a happy and long retired life.

Sir Bryce Burt (*Chairman*) thanked the speakers for their kind words and for their overgenerous appreciation of his work. Whatever he had been able to achieve was due to the full necessary support and cooperation which he had received from all those with whom it had been his privilege to work and especially from his colleagues in the Council. Though most of his official life had been devoted to work on crops and soils he had always been impressed by the essential unity of plant and animal industry. He thanked members for their good wishes. He was convinced that the Board had a great future before it and he would follow their future work with great interest.

The meeting came to a close at 5-40 P.M.

APPENDIX.

A—Summary of Recomendations.

Summary of Recommendations (Third Meeting).

Subject No.	Title.	Recommendation.
1	The etiological factors concerned in pleuro-pneumonia of goats in India.	Goat pneumonia is of very grave importance and calls for a great deal of investigation in various centres and exchange of knowledge so obtained and its correlation to hæmorrhagic septicaemia of cattle.
2	Natural outbreaks of Rinderpest in sheep and goats and their bearing on the general problem of control of this disease.	Goats and sheep are refractory to natural rinderpest infection but undoubted outbreaks occur. There is evidnece that infection can descend from cattle to sheep and goats. This subject is in the early stages of investigation which should be actively continued.
3	The methods to be adopted for the control of Johne's disease in India.	(1) Further investigation as to the incidence of the disease in the villages is necessary. (2) The question of the disposal of positive reactors should form the subject of future discussions, as slaughter of such animals is impracticable. (3) Diagnostic tests are at present not very reliable but the Double Intradermal test may be continued and it should always be confirmed by faecal examination.
4	The control of Doyle's (Ranikhet) disease in India.	No Recommendation.
5	The present position regarding the control of surra in horses and cattle.	(1) That the investigation of bovine surra should be included as an item of special importance in the future programme of work for the Veterinary Investigation Officers in India. (2) That in view of the high cost of Naganol, an investigation should be undertaken to explore the possibilities of less expensive drugs in the treatment of surra, and that, if necessary, efforts should be made to secure the collaboration of one or more leading firms of chemists in this connection. (3) That in the meantime the Bayer Company should be addressed concerning the possibility of reducing the price of Naganol so as to bring the drug within the reach of the average stock-owner in this country. (4) That a series of intensive investigations should be undertaken to determine (*a*) the minimum effective dose of Naganol in the prophylactic treatment of equine surra; (*b*) the relative therapeutic value of Naganol alone and Naganol *cum* Tartar-Emetic method in the treatment of both acute and chronic cases of this condition. (5) That in those areas where surra is prevalent, surveys should be undertaken in collaboration with the Mukteswar Institute, on the likely blood-sucking arthropods with a view to ascertaining the species or the vectors involved in the spread of the disease. In the meantime, measures should be taken, in selected surra areas, for the destruction of the egg clusters of Tabanids, which are believed to be common vectors of the disease.

Subject No.	Title.	Recommendation.
6	A review of the present position in regard to Theileriasis of Cattle in India.	(1) That the veterinary departments of the provinces and Indian States should be invited to collaborate with the Mukteswar Institute in an investigation into the incidence of bovine theileriasis in India by forwarding to that Institute blood and gland smears from animals that have succumbed to or recovered from blood-borne protozoan infections. (2) There is need for a series of 'control cross-immunity tests to determine the relationship between East Coast Fever and acute forms of theileriasis in India but that these tests should be carried out in a locality where East Coast Fever is definitely known to be prevalent. (3) That in the matter of experimental work on the treatment of acute theileriasis special attention should be given to those members of the Sulphanilamide group which are of proved efficacy for certain analogous disease conditions in the human subject.
7	The application of results so far obtained in the enquiry on the bionomics of the Warble Fly for the control of this pest.	The Board is greatly impressed by the damage caused to hides by ticks in India and recommends that the Imperial Council of Agricultural Research take up the question of further research with special reference to distribution, periodicity and the stage of the tick when damage is caused.
8	The development of pedigree Registration and milk recording.	The Board considered that pedigree registration and milk recording were of great importance for the improvement of livestock and stressed the essential point that milk recording must be conducted with great accuracy and uniformity of method as its value was of the greatest influence on the position of pedigree registration. It was further recommended that all methods of encouraging milk recording, such as establishment of milk collecting centres, etc., should be assisted in every way possible.
9	The organisation of the supply of breeding bulls with special reference to His Excellency the Viceroy's Gift bull scheme.	1. The Board recognised the difficulties and expense attendant on rearing good dairy bulls and recommended that all agencies which could, in the opinion of the Live-stock Department, be profitably employed on this work should be subsidised. 2. The Board was also of the opinion that all possible agencies should be employed to facilitate the production of pedigree bulls for milch and draught, and draught only. 3. To avoid indiscriminate location of bulls, the Animal Husbandry Wing is of the opinion that all donors under the Viceroy's Gift Bull Scheme should be informed that the selection and location of bulls purchased from such donations should be controlled by the Livestock Department or by the Cattle Improvement Society where such exists.

Subject No.	Title.	Recommendation.
10*a*	The formation of breed societies and other lines to be adopted for the improvement of milch Cattle and buffaloes.	The recommendation of the Committee that "The Committee felt that if Herd Books and registration of Indian breeds of cattle were to be made a success, it was essential that *breed societies* should be formed to work in the interests of breeders. At the same time the Committee recognised the fact that owing to the circumstances of the breeders Government assistance and a small subsidy would be essential for some years after the breed society was formed", was accepted.
10*b*	The necessity for defining the breed Characteristics of certain types of cattle exhibited under breed names.	The Board has observed that a large number of grey breeds of cattle has not yet been classified by definite breed characteristics. They recommend that the Imperial Council of Agricultural Research be asked to devise means for defining the breed characteristics of these breeds. Further, the Board considered that it would be advantageous if final selections of these types could be shown at the All-India Cattle Show at the end of the enquiry."
11	The present position in regard to the salvage of dry city cows and supply of milk to large cities.	The Committee observed with regret that no effective action had so far been taken on the previous recommendations made by the Committee which dealt with this subject in 1937 and felt that no useful purpose could be served by further reiterations and resolutions along these lines. In view of the urgency and importance of the matter, they considered that a special small committee of people, closely associated with the subject, should be appointed to investigate the question on the spot at the three Presidency towns and endeavour to elucidate a course of action which would be assented to and co-operated in by the authorities concerned . The above report of the Committee was adopted by the Board.
12	A review of the progress made in provinces and states in regard to the resolutions of the Cattle Conference held in May, 1937.	No recommendation.
13	Practical methods for the improvement and control of grasslands.	The Board notes with satisfaction the various efforts that are being made in Provinces and States towards the improvement of grasslands and recommends that these should be extended and intensified and linked up with all other movements towards soil conservation and planning for better land use. Further that Local Governments be invited to consider the desirability of taking legislative powers, where necessary, for enforcing the proper utilization of grazing areas and waste lands capable of producing fodder or fuel.
14*a*	Methods to increase fodder production with special reference to mixed farming.	The Board emphasises the importance of well-planned experiments in mixed farming and notes with satisfaction that the Governing Body of the Research Council is prepared to give small grants to assist such experiments.

Subject No.	Title.	Recommendation.
14*b*	Tree fodder with special reference to flooded areas.	No recommendation.
15	The necessity for the establishment of provincial livestock associations and Cattle Improvement Funds.	The Board desires to emphasies the value of properly organised cattle shows. It notes with satisfaction that the Central Government has provided finance for the all-India Cattle Show for a term of years and that a Show Society has been registered. District and local shows are of the greatest importance and the Board recommends that Local Governments should ensure adequate provision for the organisation and holding of such shows and for substantial prizes.
16	The improvement of the indigenous breeds of horses.	No Recommendations.
17	The migration of cattle between provinces and states with reference to its effect on :— (*a*) the control of contagious diseases, (*b*) the breeding of pure stock.	Arrangement should be made for direct exchange of information between province and province, and provinces and States regarding outbreaks of contagious diseases of cattle.
18	The measures which should be adopted in India in order to comply with international requirements regarding the examination and certification of animal products for export.	(1) All animals slaughtered for human consumption should be slaughtered in public slaughter-houses so far as possible and the animals subjected to *anti* and post-mortem examination by a qualified Veterinary Assistant Surgeon. (2) For this examination, all local bodies must employ qualified Veterinary Assistant Surgeons as Superintendents of slaughter houses. (3) All animals slaughtered at the slaughter-houses must be certified by the qualified Veterinary Assistant Surgeon as free from contagious diseases at the time of slaughter. (4) Bales of hides and skins should be marked in some way to indicate their source of origin and date of slaughter. (5) Periodical information regarding the evidence of diseases throughout India, infected areas and the dates from which areas are declared free, should be furnished confidentially to the veterinary authorities at the ports serving those areas. (6) A considerable tightening up of the reporting of outbreaks of contagious diseases among livestock by local reporting officers is required.
19	The correlation between soil defficiencies, poor cultivation, unthrifty cattle and human malnutrition.	No recommendation.

B—Papers circulated.

STATEMENT SHOWING THE ACTION TAKEN ON THE RECOMMENDATION MADE AT THE SECOND MEETING OF THE ANIMAL HUSBANDRY WING OF THE BOARD OF AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA.

Subjects.	Recommendations of the Animal Husbandry Wing.	Action taken.
1. To consider a scheme implementing recommendations of the Royal Commission on Agriculture to make provision for the training of Indians in India up to the highest standard of veterinary education. (Opening note by Col. A. Olver and Captain A. C. Aggarwala.)	*Subject No. 1.*—(*a*) A course of instruction upto the highest standard of veterinary education is necessary in India. (*b*) A separate Central College should be built and equipped for this purpose. (*c*) This College should be located at Izatnagar in consideration of the manifold facilities provided by that place. Certain recommendations in regard to recruitment to and subjects for study at the Central Veterinary College were also made by the Board.	A copy of the scheme for the establishment of a Central Veterinary College in India, as approved by the Animal Husbandry Wing, was furnished to the Government of India in the Department of Education, Health and Lands for initiating further action. The matter is still under consideration. The proposal to provide for the necessary funds in connection with the scheme has ben held in abeyance owing to financial stringency.
2. To consider the desirability of employing stockmen to supplement the work of Provincial Veterinary Departments in carrying out vaccination, castration and other livestock improvement work, and to make recommendations for the training and supervision of these men. (Opening note by Mr. W. Taylor.)	*Suject No. 2.*—Properly trained Stockmen, working under Veterinary Supervision should be employed to supplement the work of the Provincial Veterinary Departments in carrying out castration, vaccination and other livestock improvement work. They need not necessarily be matriculates but should be able to read and write labels and other ordinary things in English and be recruited from amongst agricultural classes interested in live-stock. Their pay should be preferably be Rs. 25-1/2-35, service non-pensionable and they should be trained either at large district hospitals or Veterinary Colleges, whichever convenient, over a period of six months.	The recommendations were circulated to Provinces and Constituent States and information in regard to the extent to which it was possible to adopt the recommendations was invited. The information obtained shows that the recommendations have either been, are are being, adopted by the majority of the Provinces and States. In Hyderabad, Mysore and Cochin suitable arrangements of the nature contemplated under the recommendations are reported to be in force. No specification has been taken by Bombay and the Government of the Central Provinces and Berar are unable to take any action owing to paucity of funds.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
3. To consider revision of different tables now contained in the Annual Reports of the Directors of Veterinary Services in the various Provinces and constituent States with a view to make them more complete and uniform so as to facilitate their interpretation and the compilation of all-India statistics. **(Opening Note by Mr. K. P. R. Kartha.)**	*Subject No. 3.*—(*a*) For the purpose of collecting all-India statistics, the tables appended to the Annual Reports of the Provincial Veterinary Department should be uniform. (*b*) In future the table should be arranged in the order in which they are shown in the note on the subject. (*c*) The inclusion in the Annual Reports of any statements showing the working results of live-stock farms or special experiments or investigations should be left to the discretion of the Provinces concerned and when included they should be placed after Table XI. Certain alterations in the various tables appended to the note were also suggested.	The recommendations were furnished to the Government of India in the Department of Education, Health and Lands who, in their turn, communicated them to all Provincial Governments and local administrations for the purpose of eliciting opinion. The recommendations were generally acceptable to the authorities concerned, and with their prior concurrence, the recommendations in question have been accepted by the Government of India and communicated to the former for adoption in future reports. Certain specific points of detail in filling up the prescribed form are being cleared up as and when they arise.
4. To consider arrangements that should be made enable veterinary students to take up training in dairying at the Central Dairying Institute. **(No note circulated.)**	*Subject No. 4.*—As soon as the detailed syllabus for the two parts of the contemplated I. D. D. courses is ready it should be circulated to Provincial and State Governments for opinion.	The matter was referred for consideration by the Government of India in the Department of Education, Health and Lands. The matter has since been fully considered along with Dr. Wright's recommendations. The Provinces have been addressed with a view to their taking up the question of providing suitable facilities for I. D. D. courses at Provincial Agricultural or Veterinary Colleges, as recommended by Dr. Wright. The question of providing suitable facilities, under the auspices of the centre, is still under consideration in connection with the consideration of the main question regarding the establishment of an Imperial Dairy Research Institute.

...osition in regard to the value of methods of conferring protection ...rpest and to suggest practicable ...nding such work in connection ...or the improvement of cattle.	*Subject No. 5.*—(*a*) Before arriving at a conclusion as to whether the Goat Virus should be used for general prophylaxis or for outbreak control only, further experience, is required. (*b*) It is necessary to know whether it would be possible in India to establish "Rinderpest free areas" and if so what would be the effect on such areas should Rinderpest be accidentally introduced after a considerable period of immunity. (*c*) For the control of outbreaks it is agreed that Goat Virus and Vaccine are generally safe, efficient and the most readily applied methods of dealing with Rinderpest in Indian Cattle. For buffaloes, these methods require more investigation, province by province, district by district, in each breed. At present a control dose of Serum given simultaneously with the Vaccine would be safer than Vaccine alone. (*d*) All good cattle and buffaloes and improved animals should receive prophylactic treatment. (*e*) India should be mapped out to show the areas in which the disease is enzootic.	The recommendations were commended to all provinces and constituent States and attention was drawn to the great advantage which would result if data were forthcoming to enable the Animal Husbandry Wing at their next meeting to work out a further campaign against rinderpest. Relevant extract from the information received from only a few Provinces and States is given in the attached enclosure. (See pages 128-135).
6. To review the control measures now being adopted against, Hæmorrhagic Septicaemia, particularly with reference to the use of anti-serum and vaccine. (Opening note by Mr. T. J. Hurley.)	*Subject No. 6.*—No recommendations. Need for further research emphasised.	This was noted. No specific action has been taken so far.
7. To review the position of Bovine Mastitis in India and to suggest the effective methods for its diagnosis and control. (Opening Note by Captain S. C. A. Datta.)	*Subject No. 7.*—Information of the routine methods of differential diagnosis should be circulated by the Imperial Veterinary Research Institute to the workers in the field.	The Director, Imperial Veterinary Research Institute, Mukteswar, was requested to prepare a Note embodying the latest information regarding the differential diagnosis of the different forms of Mastitis. Copies of the Director's Note on the subject were furnished to all Directors of Veterinary Services, etc., and Principals of Veterinary Colleges in India for information.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
8. To discuss effective methods of prophylactic inoculation against Black-quarter in India. (Opening Note by Mr. J. F. Shirlaw).	*Subject No. 8.*—The early appointment of an officer with special training in anærobic work is urgently needed. Diagnosis of outbreak should be carried out at Provincial Laboratories and confirmed by a specialist. Mapping of enzootic areas in provinces according to casual organisation should be carried out. Special prophylactic inoculation should be adopted as far as possible.	In view of a proposal to appoint a special officer for investigation of diseases caused by anaerobes, which was then under consideration, it was considered unnecessary to take any action on the recommendations. The matter has since been further examined and a scheme submitted to the Imperial Council of Agricultural Research by the Madras Government, has received the approval of the Advisory Board. As other Provinces are interested in the scheme the Governing Body decided that an inquiry should be addressed to all provinces regarding the facilities they could offer and the financial contribution they would make. Replies are still outstanding from a few Provinces.
9. The present position of Equine Encephalomyelitis and Kumri in India. (Opening Note by Mr. J. F. Shirlaw.)	*Subject No. 9.*—Further systematic study of these diseases, their relationship, casual factors and control is urgently needed. Arrangements should be made for the collection of all available information from all investigators engaged on the subject, and whether the results are tentative or otherwise it should be circulated amongst the workers.	The D. V. S., Army Headquarters, the Director, I. V. R. I. and the Principals of Veterinary Colleges at Lahore, Patna, Insein and Calcutta were informed that the Imperial Council of Agricultural Research would be prepared to afford facilities for publication in the Indian Journal of Veterinary Science and Animal Husbandry of the results of any investigation or observations made on the two supposed allied conditions. Further information on the subject was also invited. Some work has been carried out in Bihar and the Veterinary Investigation Officer, Bihar, has written a paper on an "outbreak of Equine Encephalmyelitis etc.," which has been published in Indian Journal of Veterinary Science and Animal Husbandry and an article on 'Kumri" by Prof. P. G. Malkani has also appeared in the same Journal.

10. To review the position in regard to the incidence and control of diseases of sheep and goats that are important from the point of view of export of these animals from India. (Opening Note by Sardar Balwant Singh and Mr. E. S. Farbrother.)	*Subject No. 10.*—Further investigation in the provinces in regard to the incidence and control of diseases of sheep and goats that are important from the point of view of export of these animals from India, is called for and the attention of Disease Investigation Officers may be drawn to this subject in the first instance. Later special study will be necessary at the Central Institute.	All provinces and the Hyderabad State were furnished with the recommendations made and requested to supply all available information. From the replies received it appears that appreciable progress has been made by the Veterinary Disease Investigation Officers as regards the investigation of diseases of sheep and goats and that information has been collected not only regarding diseases which are important from the point of view of the export trade but also about non-contagious ailments and parasitic infections. A summary showing the particular diseases prevalent in the provinces and Hyderabad has been prepared and copies were furnished to all provinces and constituent States. The suggestion that it may be possible for them to initiate research into conditions found locally, possibly in collaboration with the Imperial Veterinary Research Institute, has been commended for consideration.
10-A. Establishment of Quarantine Stations at the principal ports of India. (Opening Note by Captain A. C. Aggarwala.)	*Subject No. 10-A.*—The note on the establishment of quarantine stations at the principal ports of India should first be considered by the Committe which dealt with the Contagious Diseases of Animals (India) Act, and should then be circulated to provinces by the Imperial Council of Agricultural Research with a view to eliciting their opinions.	Captain Aggarwalla's note on the subject was circulated to all Directors of Veterinary Services in the Provinces for comments and the replies received were examined by the Council. The question of the establishment of quarantine stations at certain important ports in India, for purposes of both export and import of livestock, is at present under the consideration of the Government of India.
11. To consider improved methods for combating Anthrax in cattle by vaccine instead of serum. (Opening Note by Mr. M. I. Malik.)	*Subject No. 11.*—Futher study is necessary with regard to the incidence and spread of the disease, including the mapping out of enzootic areas. Measures of control recommended :— (*a*) the use of anthrax spore vaccine to stop outbreakes, and (*b*) also for prophylaxis in enzootic areas. In addition Civil Veterinary Department rules for the disposal of carcasses should be more stringently applied.	The provincial Governments and Constituent States were informed of these recommendations and were requested to initiate such action as might be considered desirable.

Subject.	Recommendations of the Animal Husbandry Wing	Action taken.
12. To discuss the provisions of the Bombay Livestock Improvement Act and consider the practicability of introducing them in other parts in India. (Opening Note by Mr. E. J. Bruen.)	*Subject No. 12.*—An enabling Act for compulsory castration would be an advantage in most provinces and States provided it is tactfully administered as the Act could be effectively enforced only where the great majority of breeders were agreeable and where an adequate supply of good bulls is available for service.	The recommendation was communicated to provincial Governments and Constituent States who were requested to intimate any action which might be taken by them. The replies received show that, either owing to an inadequate supply of good breeding bulls or due to sentimental grounds, the proposal does not find much favour. Legislation is considered unnecessary by Bengal, Bihar, C. P. and Berar, Assam, N.-W. F. P., Orissa, Mysore, Bhopal, Travancore and Cochin, Madras, Sind, U. P., Kashmir and Baroda are still considering the proposal. Reply is awaited from Punjab and Hyderabad.
13. To discuss co-ordination of cattle improvement measures to give full effect to His Excellency the Viceroy's Scheme. (Opening note by Colonel A. Olver.)	*Subject No. 13.*—(*a*) Wherever bulls are provided by provincial or District Cattle Breeding Associations it is essential that provision be made from the same source for their maintenance. (*b*) In order to carry on continuous improvement it is necessary that the services and accredited progeny of approved bulls shall be recorded as accurately as possible. For this purpose it is necessary to employ extra breeding staff at the rate of 1 Inspector per 50 bulls. It is not however considered feasible to carry on milk recording without special staff. (*c*) It is not possible at present to carry out strict registration of pedigree stock under average village conditions of breeding. (*d*) Where the cattle of an area are sufficiently pure the recording of approved stock in official heard-books should be taken up provincially. Such recording would be quite distinct from the official registration of pedigree stock of 7 breeds which is now being taken up by the Imperial Council of Agricultural Research.	The recommendations were circulated to all provinces and constituent States for information and initiation of such action as might be considered necessary. The information received shows that Associations have been started and Funds established in several places with a view to furthering the cause. (See item 9 of the agenda of the third meeting.)

(e) In order to effect cattle improvement on a broad scale it is necessary to greatly extend controlled breeding in areas where definite types exist and that subsequently, as large numbers as possible of selected bulls from these areas should be employed in areas where at present there is no definite type.

(f) A great deal of good could be done if the herds maintained in jails, mental hospitals, etc., at Government expense, and at Pinjrapoles are more extensively utilised for the breeding of pedigree stock and at such institutions strict milk recording should be feasible. Inducement might be given to Military Dairy Farms to rear the best of their young male stock, of indigenous breeds and to suit their breeding policy as far as practicable to the accepted policy of the country *viz.*, the improvement of indigenous breeds. Small heards of pure bred indigenous cattle should be maintained at Government Seed and Demonstration Farms.

(g) For the present free service should, as a rule be given but in certain provinces the system of charging fees should be developed.

(h) Funds collected in response to His Excellency the Viceroy's appeal should be placed at the disposal of the Department in charge of the Livestock work of the Provinces and they should not be merged in other local funds.

14. To survey the present position in regard to sheep breeding in India and to make suggestions for its development.

Subject No. 14.—(a) In order to develop sheep breeding on a broad scale, the first thing to be done is to induce non-migratory flock owners to take up the breeding of pure bred indigenous sheep.

(b) Each province should, as far as possible maintain at a central farm, nucleus flocks of all indigeneous breeds which are of economic importance in the province.

The recommendations were circularised to Provincial Governments and Constituent States who were requested to inform the Council of the action, if any, taken on the recommendations. The replies show that no action is contemplated in Bengal, N. W. F. P., Cochin and Travancore but that the rest have either initiated, or propose to initiate, action in accordance with the recommendations. The Government of Orissa are still considering the matter.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
	(c) For extensive work in the districts demonstration flocks of these breeds consisting of 50 eves and two rams each, might be issued to selected breeders for breeding pure bred stock under suitable controlled conditions. (d) The financing of such demonstration flocks should be a legitimate object on which to expend village uplift funds.	
15. To discuss the desirability of introducing cattle dips on a wide scale in India and the type of dip best adapted for use in this country. (Opening Note by Mr. R. N. Naik.)	*Subject No. 15.*—(a) All information should be obtained from Military Dairy Farms, the Government Cattle Breeding Farm, Karnal, etc, regarding the use of dips and the results achieved. (b) The Concrete Association of India should be asked to furnish information as to the design and cost of dips and as to what facilities the Association would be prepared to give if the provision of dips were undertaken in this country on a extensive scale. (c) Demonstration dips should, wherever possible be established at Government cattle breeding farms and used for propaganda purposes. (d) Recommendations made by the author should be considered when more information is available.	The Directors of Veterinary Services and Directors of Agriculture of all Provinces and Constituent States, the Director of Veterinary Services, Army Headquarters the Director of Farms, Army Headquarters and the Superintendent, Government Cattle Farm, Karnal, were asked to furnish information regarding the extent to which dips were in use and the results so far achieved. The replies show that there is no general demand for Cattle Dips and that they are not in general use anywhere in India, except in Bombay and in Military Dairy Farms. A scheme submitted by the Bombay Government for the control of ticks has been sanctioned by the Council for a period of three years at a cost of Rs. 35,700.
16. To discuss the different methods of branding and tatooing animals for purposes of indentification. (Opening Note by Mr. P. N. Nanda.)	*Subject No. 16.*—Approved cattle should be branded on the cheek with a specified mark to indicate that they are selected improved stock. Further marking for individual indentification should be done by tattooing in the ear. If branding is to be carried out on the hides it should be done on the neck.	The provincial Governments and Constituent States and also the Patiala, Indore and Gwalior States were addressed and asked to bring the recommendations to the notice of all concerned.

17. To consider the possibility of hormone therapy in the treatment of irregularities amongst breeding stock in India. (Opening note by Mr. P. R. Krishna Iyer.)	*Subject No. 17.*—No recommendations. Necessity for scientific research with Indian livestock emphasised.	The Government of India have under consideration the question of the establishment of an Animal Genetics Section at Izatnagar but owing to financial stringency the proposal has been held over for the present. Meanwhile the Imperial Council of Agricultural Research has provided a scholarship for training abroad in Animal Genetics and the Physiology of reproduction.
18. To discuss the practicability of adopting artificial insemination in India. (Opening Note by Captain S. C. A. Datta).	*Subject No. 18.*—When the proposed Genetics Institute is established the subject of artificial insemination would be another line of work which should be taken up immediately.	(See subject No. 17.)
19. Marketing of livestock and livestock products. (To consider the conclusions of the Livestock Reports of the Agricultural Marketing Adviser.) (Opening note by the A. M. A.)	*Subject No. 19.*—(*a*) Details of classifying the type of working animals into light, medium and heavy, such as by measurements, age, etc., with reference to the various breeds should be left over until the complete cattle survey report had been received from the Agricultural Marketing Adviser to the Government of India. (*b*) Information about the rate of fee charged for each animal allowed into the grounds of cattle fairs and markets should be included in the annual calendar of fairs, etc. (*c*) The licensing of brokers should be considered for recognised cattle fairs and markets.	The recommendations were communicated to the Agricultural Marketing Adviser to the Government of India for initiating further necessary action. The first draft of the All-India Cattle Report has been prepared in the office of the Agricultural Marketing Adviser to the Government of India and is being re-examined. Recommendations (*b*) and (*c*) have been dealt with and information regarding market charges and brokerage, etc., has been included and will be available when the report is published.
20. Selective indigenous breeding versus cross breeding with imported poultry for commercial egg production. (Opening Note by Mr. Nur-ul-Islam).	*Subject No. 20.*—No recommendations. Need for further research emphasised.	The Director, Imperial Veterinary Research Institute was furnished with the recommendation and was requested to carry out experiments in the matter. The Council has been informed that he will arrange for these experiments to be carried out as soon as the Poultry Research Section is in working order.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
21. Grading of hides and skins and the development of the hides and skins industry in India. (Opening Note by Mr. W. S. Read.)	*Subject No. 21.*—(*a*) In the areas affected by warble flies the Provincial Governments concerned should consider and take immediate action in collaboration with the Imperial Veterinary Research Institute with regard to warble fly infestation and implement schemes for the elimination of the warble fly. (*b*) A step in the right direction to improve the defects in hides would be to have a standardised grading system for the internal trade in hides and skins, which must be finally decided after a conference of shippers, tanners, hides and skins dealers and others interested in the trade and thereafter to initiate more hides and skins grading stations at important trade centres. (c) Investigation regarding control of ticks on livestocks should be taken up at an early date.	The recommendations were communicated to the A. M. A. to the Government of India and the Director, I. V. R. I. for necessary action. A scheme for the investigation relating to the distribution of warble flies and the incidence of infestation in India is already in progress at the I. V. R. I. Mukteswar. The A. M. A. to the Government of India held two conferences with the representatives of the Indian Tanning Industry in July 1936 and February 1938. As a result thereof, standard grades for hides and skins were decided upon, which have since been incorporated in the Agricultural Produce (Grading and Marking) (Hides and Skins) Rules, under the Agricultural Produce Act (Grading and Marking) Act, 1937. Considerable progress has been made in grading work by starting experimental grading stations at slaughter houses at Agra, Delhi, Tangra (Calcutta), Garden Reach (Calcutta), Rampur State and Karachi. First Station was started at Agra on the 24th November, 1936, and upto week ending the 22nd December, 1938, 263, 397 hides have been graded at all these stations. The Agricultural Marketing Adviser to the Government of India has also initiated a scheme of Peripatetic Hide-Grading Demonstrations in co-ordination with the Government of the United Provinces for the development of the hide industry of the province. The Demonstration Party started functioning from the 19th October, 1938, and upto week ending 22nd December, 1938, visited the slaughter houses at Lucknow and Cawnpore where 124, hides have been graded and method of grading explained to the flayers and butchers there.

		Parties interested in hide industry have been called upon to subscribe to a " Hide Improvement Fund " started by the Council and so far a sum of Rs. 600 has been collected. The proceeds are intended to be utilised in paying premiums for better flaying of hides at the experimental grading stations, etc., and for other objects intended for the development of hide industry.
		A scheme for investigating the methods of control of ticks, which is to be carried out in the Bombay Presidency, has been sanctioned by the Imperial Council of Agricultural Research.
22. Salvage of dry cows from city dairying (Opening note by Colonel A. Olver.)	*Subject No. 22.*—A small committee should go into this question again at the time of the next meeting of the Advisory Board.	A small Committee was formed, as recommended, to undertake investigation and the Report submitted by them was circulated to all provinces and constituent states for initiating any action possible. From the information received it appears that no action is necessary in so far as the majority of the provinces and states are concerned. Bengal, Bombay and the Punjab have initiated some action while Madras, U. P., Mysore, Baroda and Hyderabad have not yet done anything specific. The problem of milk supply in the city of Calcutta is at present under consideration by the provincial authorities.
23. To discuss the development of the wool and hair industries in India. (Opening Note by Mr. E. J Bruen.)	*Subject No. 23.*(*a*) A simple system of grading wool should be devised for the proper development of the wool industry. (*b*) Facilities for washing sheep may be provided at sheep shearing centres. (*c*) Report of the Marketing Survey should be awaited before carrying out a wool survey.	Representative market samples of various types of wool marketed in India were examined for their physical characteristics and commercial utility. The reports are under examination by the Agricultural Marketing Adviser to the Government of India. After examination and, if necessary, after collection of more samples, and consultation with the trade, a suitable system of grading wool will be recommended for adoption by the trade, sometime towards the end of this year. The report on the marketing of wool in India is under preparation by the Agricultural Marketing Adviser to the Government of India.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
24. Fodder and fodder resources in India .. (Opening note by Mr. W. S. Read.)	*Subject No. 24.*—The questionnaire prepared by the Animal Nutrition Committee with the specific object of obtaining, as far as possible, a statement showing the available fodder crops for the stock of each province preferably district by district, should be examined by a sub-committee of the Advisory Board before it is circulated.	The matter was placed before the Central Fodder and Grazing Committee, on its formation, who recommended that the I. C. A. R. should send out draft Tables showing details on which Provincial Fodder Grazing Committees would be asked to supply information. This has been done and the necessary particulars are still being collected.
25. To discuss the possibilities and results of utilising surplus molasses as cattle feed. (Opening Note by Dr. P. E. Lander).	*Subject No. 25.*—No recommendations ..	As work on the subject was in progress at several centres, no specific action was considered necessary.
26. To discuss the best methods for co-ordinating the work of the Central Animal Nutrition Section, Izatnagar, and similar institutions in the Provinces and to suggest ways by which the Central Institute could best function as the Central Bureau for dissemination of information. (Opening Note by Dr. K. C. Sen.)	*Subject No. 26.*—The consideration of the question should be deferred till the report of the British Experts is available.	Dr. Wright recommended that the Animal Nutrition Committee should be instructed to formulate a complete and co-ordinated scheme of investigation for submission to the Advisory Board and that subsequently the work of the centre should be reviewed annually. The Government of India in the E., H. and L. Department are examining Dr. Wright's Report and will inform the Imperial Council of Agriculture what action, if any, is to be taken by the Council on the above recommendation.
27. To discuss the control of Equine Abortion in Indian studs, with special reference to the role of minerals in this disease. (Opening Note by Dr. K. C. Sen and Mr. V. R. Rajagopalan.)	*Subject No. 27.*—(*a*) Action should be taken to collect information from private and Government stud farms in India as to the occasions on which the disease has been pronounced the treatment from the nutritional point of view and the results which have been obtained. (*b*) The Central Institute of Animal Nutrition should investgate scientifically the disease, wherever it occurs.	The Director, I. V. R. I., was asked to collect the necessary information from the Directors of Veterinary Services in India and Burma in regard to horse-breeding studs under Government control in India and to hand over the information to the Specialist Officer who was shortly to be appointed at the Institute for the study of contagious abortion of cattle, sheep and goats. The information has already been collected and the work of investigation of the disease will start shortly.

8. To discuss the present position of the work in different parts of India on the effect of mineral feeding on dairy animals, from the standpoint of production and prevention of disease. **(Opening Note Mr. P. V. Ramiah.)**	*Subject No. 28.*—(*a*) The Central Institute of Animal Nutrition should carry out long period investigations on dairy stock from birth upto 4th lactation in order to ascertain what the mineral requirements of these animals in conditions of health are. (*b*) *Pari-passu* with these investigations, the Institute should give assistance to the provinces, and in the light of its own experimental information should investigate cases which come to light indicating that mineral deficiencies are responsible for mal-nutrition and disease in dairy stock.	The Director, I. V. R. I., who was requested to submit a repoirt of the action taken, has informed that the work will be done as soon as the Animal Nutrition Section is in full working order.
29. To consider whether the time is ripe for the formation of breed and milk-recording societies in India as an aid to developing high milk-yielding strains of the more important Indian breeds of cattle and enhancing the prices of recorded pedigree stock. **(Opening Note by Mr. Z. R. Kothavalla.)**	*Subject No. 29.*—(*a*) The time is ripe for the introduction of breed and milk recording societies as an aid to developing the diary industry of the country. (*b*) There is great need for educationg the public on the advantages of using pedigree stock, and that this kind of propaganada can best be carried out through a central agency for which necessary facilities should be provided.	As a preliminary step to the establishment of Herd Books, action has been taken to define the breed characteristics of seven important breeds of dairy cattle in India. The definitions have been approved by the Standing Cattle Breeding Committee and the Advisory Board. Herd Books will be opened when the Brochure containing the draft definitions is circulated. Proposals for the formation of a Breed Society for at least one breed to begin with are under consideration at present. A scheme relating to the formation of Milk Recording Societies has already been sanctioned by the Council, which envisages the appointment of three provincial recorders in the Punjab and one recorder each in Madras, Bombay and the United Provinces. The total cost of the scheme is Rs. 11,520 spread over a period of two years. These appointments will become the nucleus of milk recording societies to be eventually started. As a preliminary to this, work in connection with the publication of milk records of approved farms in India was taken up two years ago and the first instalment of these records has been published as Miscellaneous Bulletin No. 18 of the Imperial Council of Agricultural Research.

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
30. To discuss the correlation of Central Pedigree Herd Books with methods of provincial registration. (No opening note.)	*Subject No. 30.*—(*a*) The Central Pedigree Herd Books should deal with those milch breeds of cattle which are of all India importance and should lay down forms, methods, rules, etc., for registration of such breeds to be followed by the provinces. (*b*) The application for registration of animals of such breeds should be made to Provincial organisation in the first instance who, after verification, should pass it on to the Central organization with necessary recommendations. (*c*) In order to accelerate the move for registration, for the first 1½ years of the starting of the Herd Book, no charge should be made. Thereafter a fee of about Rs. 2 should be levied on each animal registered.	Dr. Wright was consulted in the matter. His intention was to include in his Report a number of recommendations in the matter and he suggested that preliminary work in connection with the issue of a Brochure defining the breed characteristics of certain important breeds of cattle should proceed. The preliminary work done in this connection has already been explained under subject No. 29. When Herd Books are started the procedure suggested will be adopted.
31. To discuss the importance of buffaloes to the dairy industry and their place in the general agriculture of the country.	*Subject No. 31.*—(*a*) The buffalo as a dairy animal has established itself throughout India and for the development of the dairy industry, it is indispensable. (*b*) Adequate attention has not so far been given to the development of the various breeds of buffaloes and that the time has now come for making a serious effort at developing the important breeds. (*c*) The male stock is of great utility in certain types of cultivation, as such the buffalo has an important place in the general agriculture of the country.	The recommendations in question were communicated to Provincial Governments for initiating necessary action. Breed characteristics of the Murrah Buffalo have been defined, and the work of registration will be commenced soon. Arrangement has also been made so that buffaloes may have at the All-India Cattle Show the publicity they deserve.
32. Action taken on the recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at its First Meeting held in 1933.	*Subject No. 32.*—No recommendations.	

Report of the progress of the Committee appointed on the recommendation of the First Animal Husbandry Wing Meeting on the question of— (*a*) All-India Dairy Legislation; and (*b*) Legislation for Meat inspection.	*Subject No. 33.*—Legislation in regard to dairy matters would have to be provincial and any legislation which might be suggested by the Central Government would have to be of a permissive nature. The present intention should be to draw up a code which could be issued to provinces and States with a recommendation from the Central Government that it should be locally applied.	(*a*) The recommendation was further examined and as a result a draft of a set of model rules regarding adulteration of dairy products was prepared and the views of the Standing Dairying Committee of the I. C. A. R. and of the Advisory Board thereon were obtained. The draft, as approved by the latter, is now under consideration of the Public Health Commissioner with the Government of India. The result will be communicated to the Provinces and Constituent States. (*b*) The recommendation was further examined and a draft of a set of model rules for meat inspection and for the inspection of slaughter houses was drawn up and the views of the provincial Governments and Minor Administrations were obtained thereon. The rules were modified in the light of the criticisms received and submitted for consideration to the Animal Diseases Committee of the Advisory Board of the I. C. A. R. The rules, as approved by the Board, are being further examined and will be communicated to the local authorities concerned.
34. Better utilization of forest areas for grazing.	*Subject No. 34.*—(*a*) There is scope for further improvement in the quality and quantity of grazing produced by forest lands of the type which at present carry principally poor pole scrub or thorn forest and for the improvement of the amenities of grazing by the provision of better water-supplies. (*b*) Such improvement can only be effected by the provision of scientific managmement by a competent staff. (*c*) Power to control both periods of closure and numbers utlising the grazing is absolutely essential to proper management and should be provided, if necessary, by legislation.	The recommendations were communicated to the Government of India in the E. H. and L. Department for necessary action. As a result of these recommendations, a Cattle Conference was held in Simla in May, 1937. The Conference recommended that (*i*) in all Provinces, Standing Fodder and Grazing Committees should be established and (*ii*) a Central Committee to co-ordinate grass-land and fodder research and the dissemination of information should be set up by the I. C. A. R. The Conference also recommended that definite schemes of experimental work should be initiated by the Provincial and Central Fodder and

Subject.	Recommendations of the Animal Husbandry Wing.	Action taken.
	(*d*) Proper management must involve expenditure which will not be immediately remunerative, and from which even the ultimate returns will very probably be mostly indirect. The mode of provision of the necessary funds should be decided by Government. Such expenditure should not be imposed as a further burden upon the budgets of commercial or *quasi*-commercial departments.	Grazing Committees. Acting on the above recommendations the Council has set up a Central Fodder and Grazing Committee as one of its Standing Committees. The Committee has met twice and has examined and made recommendations regarding several measures calculated to effect an improvement in the existing conditions. Provincial Fodder and Grazing Committees, to work in collaboration with the Central counterpart, have been set up in the majority of provinces.
	(*e*) There is great scope for the introduction of proper management in lands which upto the present time have been outside the orbit of the activities of any of the technical departments.	
	(*f*) The organization of such improvements should vest in special Standing Fodder and Grazing Committee to be formed in each province and their activities should be coordinated by a new Fodder and Grazing Sub-Committee of the Imperial Council of Agricultural Research.	
35. The position of Animal Husbandry in India.	*Subject No. 35.*—No recommendations.	
36. To discuss the employment of unqualified castrators by Government Departments to carry out castration other than under veterinary supervision. (Opening Note by Mr. F. Ware.)	*Subject No. 36.*—The use of the Burdizzo Castrator should be extended and villagers might be trained in its use but all such castrators should work under veterinary supervision.	The recommendations were forwarded to provincial Governments and Constituent States. They have expressed themselves to be in favour of the recommendations which are being given effect to gradually.

37. Sets of formulæ to be employed in connection with experiments on Animal Husbandry and Control of Diseases. (Opening Note by R. B. M. Vaidynathan.)	*Subject No. 37.*—(*a*) The Statistician to the Council should prepare a note or notes dealing with the elementary aspects of statistical considerations. (*b*) There should be no objection to any research worker in animal husbandry submitting the layout of his researches to the Statistician for help and advice as to how far the results likely to be obtained from any given plan might be amenable to statistical interpretation. (*c*) Statistician or one of his assistants or Professor Mahalanobis may be deputed to lecture to the Animal Husbandry post-graduate classes which are annually held at Muktesar.	The recommendations were communicated to the Provinces and Constituent States who were informed that the Statistician would help and advise any research worker in animal husbandry on the design of experiments and the Statistical analysis and interpretation of results. The Principal, Allahabad Agricultural Institute, the Lucknow and Calcutta Universities, the Principal, Punjab Veterinary College and the Director, I. V. R. I. were also informed similarly. The Director was asked to arrange for Statistical lectures at the Institute.
38. International conventions relating to trade in Livestock and Livestock products.	*Subject No. 38.*—No recommendations ..	The matter was further considered by the Veterinary Committee and the Advisory Board in 1937. A copy each of three International Conventions was supplied to the provincial authorities concerned and their views were invited as regards measures to be adopted to bring India in line with other countries. A brief was also supplied to the Indian delegates attending the Assembly of the League of Nations. Steps have been taken to standardise the form used by Directors of Veterinary Services in annual reports. A proposal for legislation to prevent the spread of contagious diseases amongst animals from one federal unit to another and of regulating the export and import of animals is at present under consideration.

ENCLOSURE [SEE RECOMMENDATIONS ON SUBJECT No. 5 PAGE 113 ANTE].

Recommendations of the 2nd Meeting of the Animal Husbandry Wing Meeting on Subject No. 5 of the Agenda, *viz.*, to review the position in regard to the value of the different methods of conferring protection against Rinderpest and to suggest practicable means of extending such work in connection with measures for the improvement of cattle.

(1) That before arriving at a conclusion as to whether goat virus should be used for general prophylaxis or for Outbreak control only, further experience was required.

(2) It was necessary to know whether it was possible in India to establish rinderpest free areas, and if so what would be the effect in such areas should rinderpest be accidentally introduced after a considerable period of immunity.

(3) For the control of Outbreaks it was generally agreed that Goat Virus and Vaccine were safe, efficient and the most readily applied methods of dealing with rinderpest in Indian cattle. For Buffaloes these methods required more investigation province by province, district by district and in each breed. At present a control dose of serum given simultaneously with the vaccine would be safer than vaccine alone.

(4) All good cattle and buffaloes, and improved animals should receive prophylactic treatment.

(5) India should be mapped out to show the areas in which the disease was enzootic.

EXTRACTS FROM LETTERS FROM PROVINCES AND CONSTITUENT STATES ON THE RECOMMENDATIONS ABOVE. (THE MARGINAL FIGURE REFERS TO ITEM NUMBER OF THE RECOMMENDATION.)

Madras (Director of Veterinary Services).

In my Note placed before the meeting, it was pointed out that the use of blood virus in clean areas was attended by the risk of fresh outbreaks occurring, as a result of infection among susceptible animals contracted from those reacting to the inoculation with blood virus. A few instances recorded in the districts were also quoted. During the past 2 years natural outbreaks of Rinderpest have been restricted to a few districts in the north, the greater part of the Province being practically free. Yet, a few outbreaks of Rinderpest have been recorded in places in clean areas far removed from the scene of natural outbreaks and in which the source of infection could not be traced except on the assumption that the inoculations conducted in the area were the foci of infection. The method, moreover, has become increasingly unpopular among the ryots to whom the Serum Simultaneous inoculations conducted in previous years by this Department were familiar. Though the method of prevention with blood virus is cheap and effective, the severe reactions set up in buffaloes and the consequent loss through fall in milk-yield loss of flesh and working capacity, etc., following the inoculations have been sufficient to prevent ryots from offering their animals for protection by this method. These symptoms are observed more among buffaloes than in cattle, hence the figures for cattle protected by this method include a great preponderance of cattle over buffaloes

though the latter class of animals because they are more susceptible to Rinderpest, require greater attention in a campaign against the disease. Under the circumstances, I am not in favour of extending this method. As regards its use as an " outbreak stopper " this Department has had little experience as it has not been used for the suppression of cattle outbreaks except on 2 occasions where the reactions set up were wrongly considered to be attacks of the disease as a result of the inoculation. No further use of the method in outbreaks was therefore made.

(2) I am of the opinion that this is neither feasible nor altogether desirable. For the policy of eradication of Rinderpest involves a staff of Veterinary Police to control movements of cattle particularly across the borders of this Province which will never be possible, at least for a long time to come. Geographical buffers of immune cattle do not seem desirable and because of migration for grazing, would be almost impossible to attain. I have particularly alluded to this matter and have stated that I prefer scattered but widespread buffers all over the Presidency. Eradication of Rinderpest, even if feasible, will result in creating herds of high susceptibility owing to being screened from natural outbreaks of Rinderpest. Any outbreaks under those conditions will be be difficult of control.

(3) The method has been introduced as an experimental measure since 1st January 1938 and 36,907 cattle have been protected in outbreaks and 5,197 in clean areas. The dose of serum has been tentatively fixed at 6 c.c. per cattle and 8 c.c. per buffalo, per 100 lbs. body weight with a minimum of 15 c.c. The results have shown that the dose can be reduced in certain districts. Fnrther experiments are being conducted, and will, it is hoped, result in a considerable reduction of serum.

(4) At present all cattle offered for protection are being inoculated against Rinderpest, preference being given to the more valuable ones when the supply of serum or vaccine was available at hand is insufficient to meet the demands. It is not considered desirable to discriminate between good cattle of the rich ryot and the inferior cattle of the poor ryot.

(5) I agree that a map showing the areas enzootic to Rinderpest would be of use. In this Province, the districts of Vizagapatam, East and West Godavari and Kistna may be considered to be enzootic areas.

Bombay.

(1) From the experience so far gained, goat virus should not only be used in controlling actual outbreak of rinderpest but also for general prophylaxis in India. Unless prophylaxis is attempted on a wholesale scale, Rinderpest will prevail for ever and continue to inflict heavy loss to the cultivators.

(2) It is quite possible to establish Rinderpest free zones, although this has not been attempted in this Province nor anywhere except probably in Mysore. But to achieve this, sufficient number of field workers would have to be made available and vaccinations made compulsory in the affected area.

(3) Goat Virus vaccinations have already been carried out in different districts on different breeds of buffaloes on large scale inasmuch as 41,023 buffaloes have been vaccinated from August 1935 to November 1936 ; of these 242 died ;

mortality being ·58 per cent. while in cattle it is about ·16. Buffaloes generally react more severely than cattle.

(4) All cattle and buffaloes, irrespective of their body conditions and breed should receive prophylactic treatment. It will not be proper to allow inferio cattle, probably the only resource of some of the poor peasants, to die when a efficient remedy for protecting them is available.

(5) Rinderpest is prevalent in the whole of the Bombay Presidency enzootic ally throughout the year. Bombay Presidency showing areas in whic Rinderpest is prevalent enzootically has been mapped out.

Bengal (Veterinary Adviser to Government).

Agreed to the resolutions adopted at the Madras meeting. In Benga
(1) & Goat Tissue Vaccine is used alone to control outbreaks of rinderpest and i
(3) applied to all Indian cattle, except Hill cattle, and to all buffaloes of Benga breed with safety. Upcountry buffloes and Hill cattle are given a simul taneous dose of serum with Goat Tissue Vaccine.

(5) Mapping of Bengal is being carried out.

(4) Improved stock are protected free of cost.

United Provinces.

There is no particular enzootic zone in the United Provinces and all dis
(5) tricts have outbreaks of rinderpest in a mild, moderate or severe form. Map have been prepared which show the extent of the disease in the different district and how it varies from year to year.

Central Provinces (Director of Veterinary Services).

(1) The experience in the Central Provinces is that goat virus alone metho can be used effectively, both for prophylaxis as well as for the control of out breaks. A small percentage of mortality is, however, observed in buffaloes and in cattle of hilly tracts.

This province is in favour of creating rinderpest free areas and has alread started the spadework. As a first step, the department undertook the vacc nation of cattle in the villages lying alongside the main cattle traffic route thereby minimising the spread of infection from imported cattle. Secondly quarantine stations have been opened in the north and north-west borde of the province and all cattle passing through these stations are subjected t
(2) goat virus vaccination. Thirdly attempts are being made to create " Rinde pest free zones ". The procedure adopted is to select a number of village where rinderpest was prevalent constantly during the last few years and t immunise the animals in these villages with goat virus. Around this unit c villages a protective belt is created by subjecting the animals in the belt are either to periodical vaccination or to vaccination at the appearance of rinde pest in the belt area. The inadequacy of the staff however hinders the presen progress of this work. It is difficult to predict what would be the effect if rinde pest suddenly breaks out in such an area. But it is natural to presume that th cattle in such an area would readily fall a prey to the disease unless they sti possessed the natural immunity gained through generations of exposur This difficulty can however be averted if periodical prophylactic vaccinatio are carried out.

It is beyond doubt that goat virus and vaccine are safe and efficient and can easily be applied. There is a certain amount of risk in buffaloes, resulting in a small percentage of mortality, about 1 per cent. This can be overcome by giving serum simultaneously. The same applies to cattle of hilly tracts. Lately it is observed that goat tissue virus does not give such satisfactory results as blood virus. (3)

Special attention is being paid to prophylactic vaccination, specially in valuable cattle. (4)

A map of this province showing rinderpest areas has been prepared. (5)

Bihar.

Further experience tends to show that goat tissue virus can profitably be used both for general prophylaxis and for control of actual outbreaks. In the case of buffaloes in which inoculation of serum along with virus is recommended a tentative table of dosage for Anti-Rinderpest serum has been worked out. (1)

It would be hardly worthwhile to establish Rinderpest free areas if the suggestion that measures for improvement of cattle and immunisation against Rinderpest should go hand in hand are adopted. Perhaps a study of small-pox vaccination campaign amongst human beings will furnish a reply to the point raised in the latter part of the recommendation. (2)

Same comments as have been made against recommendation No. (1). (3)

Government are advised that the recommendations of the Animal Husbandry Wing in this respect should be accepted with the provision that, if demanded, the treatment should not be denied to the poorer type of animals. If necessary, to discourage keeping and breeding of bad types, a small fee of few annas for immunization may be charged for poor type of animals, but the better animals should be vaccinated free of cost. (4)

It is impracticable to furnish any map showing areas in which Rinderpest was enzootic. In Bihar the disease was never localised but was general during the worst outbreaks. Any attempt at collecting data would, therefore, be futile. (5)

Punjab (Director of Veterinary Services).

Vaccination of cattle and buffaloes with the Tissue vaccine has been given a trial on a large scale in the Province both for general prophylaxis and for the control of outbreaks. 13,51,522 cattle have been immunised by this method during the period from 1st April 1935 to 31st October 1938. The immunisation of livestock was satisfactory in both the cases but the buffaloes generally gave a severe reaction followed by a decrease in milk. Some of them which were at the end of the lactation totally dried up. Some abortions also occurred. The zemindars resent very much this severe reaction in buffaloes except when goat virus vaccination is done at the time of actual outbreaks. Regular monthly prophylactic vaccinations are being carried out throughout the Province and except for the occasional severe reaction in buaffaloes the results have been highly satisfactory. When there is an outbreak of Rinderpest an immune zone is generally produced around it by vaccinating the cattle of neighbouring villages. (1)

(2) A Rinderpest-free area was established in the Mukerian sub-tehsil, District Hoshiarpur by the wholesale immunisation of the livestock with goat virus vaccination in 1935 and it has remained free from Rinderpest uptil now. Much headway, however, cannot be made in this direction on account of shortage of the district staff, the large movements of cattle and the opposition of the owners in the absence of legislation to the prophylactic vaccination of their stock.

(3) As mentioned above all outbreaks of Rinderpest in the Province are now being controlled by the use of goat virus vaccine. In the case of buffaloes a control doze of serum given simultaneously with the vaccine has been extensively tried but has proved useless.

(4) The principle that all good cattle and buffaloes and improved animals should receive prophylactic treatment is accepted and regular monthly vaccinatios are carried out as a prophylacitic measure in each hospital *ilaqa* generally in those villages where the cattle owners are willing to have their cattle protected.

(5) The disease in this Province is met with in enzootic form with the exception of Attock and Rawalpindi districts and major part of the Jhelum district where it is very rare and only sporadic outbreaks have been reported from time to time.

Assam.

Goat Tissue Vaccine inoculations have been carried out with very promising results both in the face of epidemics and in the absence of epidemics

(1) & (3) The Goat Tissue Vaccine was found quite safe for plains cattle in all circumstances in this Province. In some cases however the result was not as happy, but it was not due to any fault of the vaccine. Experiments were carried out in buffaloes but it cannot be yet said with certainty whether the Goat Tissue Vaccine alone can be injected to buffaloes, specially to the Manipuri, Khaspuri and Cachar buffaloes. On the other hand it was seen that when a controlling dose of Rinderpest serum was given with a reduced dose of the vaccine there had been no loss of life though in some cases the reaction had been rather more than what was desired. According to recent experiments it appears that Bhangar buffaloes stand better the operation with Goat Tissue Vaccine. It was found that in some such animals which were long acclimatised in Assam half the dose of the Goat Tissue Vaccine (1/2 c. c. dose) alone did not provoke any intense reaction. So far as buffaloes are concerned further investigation is necessary and the work is in progress.

(2) It would not be very difficult to establish Rinderpest free areas if vaccination with Goat Tissue Vaccine of plains cattle and Sero-virus inoculation of more susceptible animals are carried out. The experiment was tried in one area and it was found that villages treated with Goat Tissue Vaccine escaped infection though the cattle of the locality were freely exposed to it.

North-West Frontier Province.

(1) With a view to gain further experience goat virus is being used in this Province both as a general prophy lactic and to control outbreaks of the disease. It is extremely effective in controlling outbreaks of the disease

It is not considered possible at present to establish Rinderpest free areas in this Province. (2)

Goat Virus has been extensively used in this Province since 1935 for the control of outbreaks and is found to be safe, efficient and effective. The use of Goat Virus is safe and efficient in the case of buffaloes kept under village conditions but should be used with caution in the case of buffaloes that are stall fed. In the case of such animals a dose of special serum is used. (3)

Prophylactic treatment in the case of stud bulls and other valuable cattle including buffaloes is followed in this Province. (4)

Sind (Director of Veterinary Services).

For the control of outbreaks in cattle, the Goat Tissue Virus method has been in use for the last three years. On the whole, it has given good results, although occasionally very severe reactions and deaths have occurred. From 1st April 1937 to 31st March 1938, 19,171 cattle were vaccinated with 68 deaths. When vaccination has been carried out in Rinderpest free herds, no deaths have occurred and it seems probable that the cattle which have died during outbreaks, were in the period of incubation when they were vaccinated. (1)

Upto 12 months ago, buffaloes were vaccinated by the same method, but following a 50% mortality in a herd of 250 animals in Hyderabad-Sind District, all buffaloes have since been vaccinated by means of Goat issue Virus combined with a simultaneous injection of Anti-Rinderpest serum in doses of 20 to 30 c.c. Since this method was adopted the mortality has been negligible, although occasionally animals show severe reaction. (3) (3)

All Government cattle and those belonging to private owners who desire it, receive prophylacic treatment. (4)

Except possibly in the desert division of Tharparkar district the disease does not appear to be enzootic and the geat majority of outbreaks occur in areas on the left bank of the Indus which adjoin the Indian States of Rajputana, Bahawalpur and Khairpur Mirs and where there is considerable movement of cattle to and from in search of grazing. Rinderpest seldom occurs on the right bank of the river, where owing to the mountainous country between Sind and Kalat and Baluchistan, there is comparatively little movement of cattle. (5)

Orissa.

The Government of Orissa fully agree that further experience is required before arriving at a conclusion as to whether goat virus should be used for general prophylaxis or for outbreak control only. The introduction of goat tissue virus inoculation against Rinderpest in this Province is still in an experimental stage although a fairly large number of animals were protected during the last two years by this method of treatment. (1)

Rinderpest takes a heavy toll in almost all the districts of this Province. In order to establish rinderpest free areas in India, it will be necessary to introduce compulsory inoculations by serum-simultaneous-method and to appoint a large number of special staff for the prupose in each disitrict which are next to impossible, partly owing to religious supersititions and partly to the heavy expenditure that will have to be incurred. (2)

(3) & (4) For the cattle of this Province goat vaccine is safe and efficient although, it causes high reaction in the case of buffaloes which should have a prophlyactic dose of serum simultaneously with that of the vaccine. This practice has been followed in this Province during the last two years with satisfactory results. It should also be followed in case of cattle with foreign blood and other improved animals for the present.

(5) In this Province the disease is enzootic in the districts of Sambalpur, Ganjam, Karaput and in the Angul sub-division of the district of Cuttack. It will be highly advantageous if India can be mapped out to show such areas.

Hyderabad.

Reply awaited.

Mysore.

(1) Out of the several methods of protection of cattle aginst rinderpest, goat blood virus alone, with a control dose of anti-serum simultaneously in the case of debilitated animals and buffaloes has given very satisfactory results in Mysore State for several years.

(2) The immunity after goat-virus alone inoculation, both in the villages and among Amrit Mahal Cattle, has been found to last for more than four years.

(3) Goat Virus vaccination is being practised generally as an outbreak control in infected villages and as a prophylactic measure in Government dairy farms, Amrit Mahal herds and in villages surrounding the infected ones.

(4) The suggestion to inoculate all good cattle and buffaloes of the State as a prophylactic and to make rinderpest vaccination and cattle breeding go hand in hand is commendable and will receive the attention of Government. As the Mysore State is surrounded by Bombay and Madras Presidencies, it will be necessary to implement legislative powers to detain cattle coming into Mysore, at the important road entrances, in cases of prevalence of rinderpest in their borders, particularly during the heavy movement of cattle to and from the very many important annual cattle fairs.

(5) A map showing the areas in which the disease is enzootic has been prepared

Kashmir.

Reply awaited.

Baroda.

(1) & (3) Goat Virus Vaccination method has been resorted to since the year 1937-38 in clean as well as infected villages and 37,480 animals have been vaccinated. It is found that the cold season is most suitable for carrying out the prophylactic vaccinations in clean villages. There were only 8 deaths in the total number vaccinated, seven of them being buffaloes and one cattle. As for the reaction it was rather severe in buffaloes. The milk yield of buffaloes in advanced stage of lactation had either decreased partially or completely, while in the case of newly calved animals, it was only temporarily affected but came to normal afterwards. Animals in advanced pregnancy, debilitated animals and youngstock were not vaccinated.

Bhopal.

Goat virus inoculation of the cattle against rinderpest has not been started in the Bhopal State as yet ; and at present the " Serum alone " method is being used.

Cochin (Director of Agriculture).

There was no outbreak of Rinderpest in the State for the last 6 or 7 years. Since the disease is not enzootic in the State there are no data to be supplied for consideration at the meeting of the Animal Husbandry Wing.

Travancore (Director of Agriculture and Fisheries).

There has been no out-break of rinderpest in Travancore in an epidemic form during the past three years. It has not therefore been possible to try the effect of goat virus inoculation. In order to guard against the importation of infected cattle from outside the State and to afford thus a preventive means of protection to the cattle within the country, Government have recently sanctioned the establishment of two quarantine stations on the frontier bordering the British Indian territory. The question of resorting to the goat virus treatment shall always be borne in mind.

NOTE ON SUBJECT NO. 1.

THE ETIOLOGICAL FACTORS IN GOAT PNEUMONIA IN INDIA.

BY

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Intensive research on this problem dates from 1919. Between the years 1919-23, Mukteswar was approached by the Provinces of Bombay (including Sind), Punjab and N.-W. F. P., and the United Provinces for help in the elucidation and control of Goat and Sheep diseases. Pneumonia of rather a peculiar type was stated to be the most serious problem affecting breeders and was said to occur most severely in the sub-montane tracts, although not confined to them.

One breeder in Bombay Presidency stated that a form of goat pneumonia known locally as " GOOM " was responsible for 40—80% losses and was a very serious obstacle to goat breeding.

In 1923, the disease reached such diminsions in Garhwal (U. P.) as practically to exterminate certain herds and losses were generally so great that goats had to be imported from China. The Civil Veterinary Department, U. P., reported that this outbreak was complicated by goat-pox in an unusually virulent form.

In the same and succeeding years, the Superintendent, C. V. D., Sind, reported serious losses from this disease and evidence was obtained of similar happenings in Baluchistan and N.-W. F. P., while the Superintendent, C. V. D., Punjab, reported a virulent form of goat pneumonia in the Kulu Valley and Kangra districts. About this time, the Superintendents in the affected provinces were fairly unanimous in their belief that goat pneumonia is specific infectious disease of goats, comparable in its manifestations to contagious pleuro-pneumonia of cattle, and probably related to it etiologically, although no concurrent disease of this nature was seen in cattle. So strongly was this opinion held by the Superintendent, C. V. D., U. P., that Mukteswar was asked to consider the preparation of a vaccine for goats on the lines adopted in the control of contagious pleuro-pneumonia of cattle.

Edwards then concentrated on the problem as a whole and commenced study on the etiological factors concerned. His preliminary work was mainly directed to the examination of pleural fluids from acute cases of the disease. Bacteriological examinations were considered to give negative results, although from a considerable number of cases, an organism of the corynebacterial group was isolated. Edwards considered this organism of no importance and probably only a secondary invader.

He formed the opinion, at an early stage of his investigations, that a filterable virus was probably the cause. His transmission experiment yielded negative results. He found it difficult to obtain satisfactory specimens from the field and the local goats, when submitted to inoculation experiments, showed a tendency to die from acute verminous pneumonia and

purulent peritonitis. On the results of his experiments on Rinderpest at Mukteswar, Edwards considered that the specific lesion of Rinderpest in goats is pneumonia and he expressed the opinion that the disease in goats may, in certain cases, be rinderest. Information from the field did not, however, support this opinion. Outbreaks of rinderpest in cattle did not simultaneously occur with the disease in goats.

In 1926, Cooper investigated goat pneumonia on a bacteriological basis. His frequent finding of organisms of the corynebacterial group in swabs from diseased lungs inclined him to study these organisms in greater detail. He finally agreed with Edwards' opinion that they were probably of no significance. Impressed by the large number of cases of pneumonia spontaneously occurring in goats at Mukteswar he conducted bacteriological examination on the diseased lungs from which he isolated an organism of the pasteurella genus which proved pathogenic for rabbits. From an outbreak in the Garhwal hills, he isolated a similar organism, thus satisfying himself that the disease of goats naturally occurring at Mukteswar did not radically differ from that reported from the Provinces.

His subsequent transmission and vaccination experiments yielded unsatisfactory results, chiefly through the tendency of goats to develop spontaneously pneumonia of a verminous type. In vaccinated animals that succumbed to pneumonia, he found *Corynebacteria* and *Stereptococci*. Haddow, about the same time, investigated the disease at Izatnagar and was of the opinion that the casual organism was a diplococcus, probably a pneumococcus and was able to reproduce the disease by placing goats in infected stables, recovering the same organism from these experimental subjects. He considered the disease to be an acute bacterial pneumonia.

From that time, interest in the problem was superseded by more pressing work.

In 1936, the Veterinary Investigation Officers of Madras Presidency and N.-W. F. P. reported the disease as a major cause of loss in goats, and Ware reopened intensive research. The writer decided to study the problem on a purely pathological basis to commence with and considered, on an examination of existing specimens, that the type of pneumonia was not a virus type ; at least it was not pathologically similar to contagious pleuro-pneumonia of cattle. He formed the opinion that these specimens could be divided into two main categories ; (*a*) a chronic septic pleuro-pneumonia, simulating in some cases, the lesions of phthisis and (*b*) a progressive indurative type. Both types appeared, however, related to a common factor, *i.e.*, infection with organisms either of the corynebacterial group or less frequently of the pasteurella group.

The striking feature was that the basic, underlying lesion was one of verminous infection on which the secondary bacterial infection seemed dependent for the initiation of the pneumonic process.

The damage to the bronchial epithelium and the bronchiole system by the parasites seemed to pave the way for latent infections and the types of pneumonia secondarily developing then appeared to be determined by (*a*) the degree of that damage, (*b*) the type of invading organism and (*c*) its

virulence and (*d*) the inherent capacity of the lung to react to the syndrome of infection.

The first type was obviously one in which the affected lung proved unable to withstand the infection and had undergone rapid septic invasion, and the second type was one in which the resistance of the lung tissue or the low pathogenicity of the invading organism had resulted in a very chronic and proliferative, even granulomatous, type of interstitial pneumonia.

The fact of importance emergimg from these examinations is that parasitic invasion of the lung plays a predominating part in the evolution of the syndrome. That this opinion of the essential pathology is probably correct is substantiated by the fact that when any initial depressant is inoculated in supposedly healthy goats at Mukteswar (*e.g.*, Rinderpest and Pox viruses) the inevitable result is pneumonia of the types described, usually the acute corynebacterial form. The Veterinary Investigation Officers have recently supplied many specimens from field outbreaks and an examination of these specimens has confirmed the hypotheses eventuating from preliminary examinations.

The majority, if not all of these lung tissues, show a varying degree of chronic verminous intestitial change, a form of pneumonia in which there is evidence of a latent *sui generis* infection held in abeyance and only awaiting the incidence of a debilitating factor to precipitate a crisis. Recent work on the problem has centered on the essential bacteriology of the disease. The types of infection which have been encountered are (*a*) corynebacterial, (*b*) pasteurella and (*c*) streptococcel, the former constituting about 80%.

To the first group considerable study has been devoted.

At the same time, attention has been directed to the pathological study and normal bacterial flora of healthy lungs of goats, slaughtered for food at Mukteswar. From these examinations, it has been found that the majority of supposedly healthy goats harbour within the respiratory tract the seeds of a lurking pneumonic process, which only await the chance to germinate. It appears therefore, at this stage of the research, that goat pneumonia is a complicated syndrome requiring at least three factors for its development:

(*a*) A chronic verminous infection, with primary destructive effect on the lung tissues, (*b*) the existence of a latent infection or sub-pathogen in the lung tissues, and (*c*) a depressant factor whose constitution is not as yet well understood but may comprise any of the known faults of animal husbandry; while the possibility of a terminal virus infection must not be overlooked. Does the key to problem of goat pneumonia lie in the control of verminous infection. On the basis of research achieved since 1919, this does not appear an unwarranted suggestion.

NOTE ON SUBJECT NO. 2.

NATURAL OUTBREAKS OF RINDERPEST IN SHEEP AND GOATS AND THEIR BEARING ON THE GENERAL PROBLEM OF CONTROL OF THIS DISEASE.

BY

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The subject is one in which there is considerable difficulty in selecting the method of presentation, because owing to the absence of a mass of well-authenticated data it may be that items which seem important now may fade into insignificance when more records are available. There is no doubt that more information is urgently required. It is the writer's purpose therefore to denote the questions to which an answer is required rather than to convey imformation on the subject head.

There is no doubt that sheep and goats are susceptible to Rinderpest and there appears to have been a definite tendency in India to accept this statement without further examining its implications. It is only reasonable to believe, until it is proved otherwise, that, since these animals are susceptible, they may play a considerable roll in the spread and maintenance of the disease in India and they must be given due consideration in any scheme for the control of the disease.

Continuing this line of thought a very striking point is the fact that, while reported outbreaks in cattle and buffaloes are legion, reported outbreaks in sheep and goats have been so uncommon in past that they receive special mention but have not so far called for any special measures of control. It is not yet clear whether the paucity of reports is due to a meagre rate of infection or whether it is due to lack of interest in the diseases of these animals and also to possible difficulties in arriving at a correct diagnosis.

There is evidence that a diagnosis of rinderpest cannot be made in outbreaks among sheep and goats with the same degree of certainty as it can in bovines. The classic lesions in the mouth and the remainder of the alimentary tract are frequently entirely absent and if present, are overshadowed by a striking inflammation of the respiratory organs. A diagnosis of pneumonia or pleuro-pneumonia may well conceal an outbreak of rinderpest especially in goats. A particularly heavy and apparently universal verminous infestation of the lungs of these animals makes them peculiarly susceptible to the development of an evident pneumonia following a coincident infection of viral or bacterial origin or indeed any thing which acts as a tissue depressant. A large variety of causes therefore give the same end picture and it is not always easy to determine the causal factor. It seems that until further evidence is available the presence of rinderpest as a factor in the causation of these outbreaks of so-called pneumonia or pleuro-pneumonia should always be considered and where possible definitely eliminated.

On the other hand a low rate of infection may exist either on account of environmental factors depending on differences in the methods of husbandry

adopted for cattle as compared with sheep and goats or the comparative susceptibility of these species may be of some importance. Hill goats like their bovine confreres of the hilly tracts are experimentally highly susceptible and the factors governing this susceptibility and the incidence of actual disease are probably the same for both cattle and goats. In the plains susceptibility would appear to vary but there is as yet no very precise information as to whether any degree of variation can be ascribed to a particular strain, to a locality, or to actual contact with the disease. In sheep the position is still more obscure. Severe outbreaks with heavy mortality are known to have occurred but it is also reported that sheep coming in from Tibet and from the hinterland of the Himalayan foothills are not susceptible. It is also said that in these sheep the virus can be demonstrated in the blood for a much longer period than is the case in bulls, and if this is the case it is possible that these animals remain infective for their own aud other species for a proportionately longer time.

Some information on the points mentioned must be forthcoming before a reliable system of control can be recommended. If there are more or less natural obstacles to the transmission of the disease from cattle to sheep and goats, adequate control might possibly be achieved by the accentuation of these factors at critical times. While the effort at control must be commensurate with the value of the animals attacked and their potential danger to more valuable animals, it is apparent that if large scale work is necessary a cheap method of prophylaxis will have to be evolved. Control by means of serum alone and virus and serum have been tried and would probably prove satisfactory where small numbers only are involved. As with cattle the serum simultaneous method is to be preferred on grounds of efficacy and economy. The use of some form of vaccine appears to be indicated but until more is known of the susceptibility of the animals to be vaccinated and the possibilities of spread from such vaccinated animals attempts in this direction will require to be undertaken with caution.

The addition of the diseases of sheep and goats to the list of subjects for intensive study on the programmes of the Disease Investigation Officers appointed by the Imperial Council of Agricultural Research has already materially increased our knowledge of this subject and it is to be hoped that the continuation of these studies will eventually point the way to a correct solution of the problem.

NOTE ON SUBJECT NO. 3.

METHODS TO BE ADOPTED FOR THE CONTROL OF JOHNE'S DISEASE IN INDIA.

BY

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The existence of Johne's disease among cattle in India was first brought to light by Sheather in 1917. It is obvious from the reports of the Investigation Officers and the results of the recent investigations undertaken in Mysore that the disease is found to exist in Government and private Dairy Farms in Bengal, Bombay, Madras, the United Provinces and Mysore ; and in Assam the disease is reported to be endemic among cattle and goats. From this it may be presumed that it is fairly widespread in India.

Paratuberculosis or Johne's disease, as it is more commonly known, is essentially a bovine disease. But it has also been recorded in sheep, goats, swine and deer. It has not so far been detected in horses and no one has yet succeeded in transmitting it to any of the small laboratory animals.

Recently in Mysore goats treated intravenously with virulent material from bovines were found to take up the infection much more readily than cattle within 4 to 6 months. This finding is significant inasmuch as these animals bid fair to become ideal animals for the intensive study of the disease.

Johne's disease may be defined as a chronic specific enteritis, affecting principally cattle, caused by *Mycobacterium paratuberculosis*, and aerobic, spore-less, nonmotile, acid-alcohol-fast bacillus, which is usually found in nests and in large clumps in the affected parts of the intestinal mucous membranes and in the mesenteric lymph glands. The organism is 0·5 to 1·5 microns long and 0·3 to 0·5 microns in width and, like the tubercle bacillus, it stains more or less irregularly.

The disease was first studied bacteriologically in Dresden by Johne and Frothingham in 1895. But Twort and Ingram first succeeded in growing the causal organism on artificial media in the year 1913.

The organisms are voided with the faeces of advanced cases, and hence on farms where the disease exists, the cow byres, pastures and ponds are all potential sources of infection. The organisms are peculiarly resistant to disinfectants and are known to survive in most surroundings for many months.

The resistance offered by the organisms to disinfectants and agents, ordinarily looked upon as lethal for most bacteria, raises immense difficulties when treatment of pastures is contemplated.

Exposure to 20 per cent. antiformin for half an hour does not destroy these organisms and they appear unharmed after immersion in 10 per cent. copper sulphate for six hours. 24 hours' exposure of a culture in an atmosthere of sulphur dioxide of a concentration, which would probably kill guineapigs and rats in fifteen minutes, has little or no effect on their vitality.

In most cases there may be complete absence of clinical symptoms whereas the examinations of bowel washings, rectal smears or allergic tests might confirm the disease. It is the insiduous character of the disease and its long incubation period extending over years sometimes, in an animal, that are of vital importance, especially in heavily stocked farms and on community pastures under village conditions.

Diagnosis.

The diagnosis of the clinical cases is relatively simple. Diarhœa, persistent and intermittent, is a prominent symptom and there is a progressive wasting of the musculature, particularly of the hind quarters. The animal continually loses condition although possessing normal appetite and feeding well. The difficulty in diagnosing the very early and non-clinical cases has been a great stumbling block to the investigational work. In the early study of the disease the absence of pure cultures a Johne's bacillus led several workers to employ vaccines prepared from allied acid fast bacilli, and with the finding that the product prepared from avian tubercule bacillus, was capable of exciting a positive reaction in an animal suffering from Johne's disease, avian tuberculin came into use as a diagnostic agent.

But the value of such a reaction could not be correctly assessed unless the animal was subjected to a simultaneous test with mammalian tuberculin, for avian tuberculin is also capable of provoking a reaction in tuberculous animals. Later when Johne's bacillus could successfully be cultivated on artificial media, great hopes were built on Johnin which was elaborated in the same manner as tuberculin. M'Fadyean, Sheather and Edwards [1916], Dunkin [1928] and others prepared Johnin and carried out extensive tests. From the results recorded it is observed that Johnin appears to be a more reliable and specific diagnostic agent. It may be stated that a uniform method of testing with a standardised Johnin is a *sine qua non*, as the success or failure of the test depends mainly in the potency of the product.

Complement fixation test has also been recommended by many workers as a useful aid to diagnosis, especially in advanced cases which fail to react to allergic tests. It appears to be the best method to demonstrate whether a wasting, scouring animal is infected with Johne's disease or not. The development of this method of diagnosing cases of Johne's disease would, therefore, be relevant to any scheme of control measures.

Post-mortem appearances.

The post-mortem appearances are fairly characteristic although the pathognomic symptoms are not always present. So far as is known, the histopathology is confined to the intestines and associated lymph glands. But in infected goats the thoracic lymph glands are also observed to be involved with destructive changes. The mucous and submucous layers of the intestines are very much thickened and the former are thrown into numerous folds invariably in chronic and typical cases presenting a corrugated and wrinkled appearance. The mesentric lymph glands may appear enlarged and softened and the cut surface exuding a milky fluid. The disparity between the lesions produced and the massive infection is sometimes very striking.

Although treatment of diseases due to acid-fast group of bacteria is unsatisfactory, I may be permitted to refer here to the several attempts made to treat Johne's disease. Drugs such as ferrous-sulphate, sulphuric acid, formalin have all been tried and have been found to check the diarrhœa only temporarily, but have failed to cure the disease. Mention may also be made of attempts, made in India to treat the disease by non-specific proteins, such as spleen extract and egg albumin at Mukteswar. The possibility of treating the disease by a bacteriophage has also been investigated (1932) at Mukteswar without any success.

Williams (1928) in America used Chaulmoogra oil in the treatment of Johne's disease, being prompted by the similarity of the type of bacteria causing leprosy and Johne's disease, with inconclusive results. Downham (1928) also used Chaulmoogra oil upon six cases and obtained 50 per cent. success. The curative value of Chaulmoogra oil is at present under investigation in Mysore.

The significant discovery of easy transmission of the disease to goats offers immense possibilities for research into the treatment with Ol. Chaulmoogra as well as in the standardisation of Johnin or any other diagnostic agents.

Although vaccination of young calves as a measure of prophylaxis against the disease has been described by the French workers Valle and Ringard, attempts made so far in India (1937) have yielded rather disappointing results.

Thus it is seen that under the present state of our knowledge, we have no successful method of vaccination of the disease nor is the disease a curable one. Attempts should be made to find out these in time.

The incidence of the disease appears to depend more upon the opportunity for the animal to pick up the infection and a predisposition to it, rather than upon breed, age or sex. The influence of parturition in precipitating a crisis in Johne's disease and other factors, that lower the resistance of the animal, are found to predispose the animal to the infection.

For instance, the insistance of the dairy farmer on heavy milk yields in his cows, thus inducing mineral deficiency and reducing the vitality of the animals, renders them more liable for infection. For this reason the disease is more prevalent among the very heavy milk yielders in the several dairy farms.

The possibility of heredity being a transmitting factor has also been investigated by several workers. Attempts to demonstrate this important factor were made both at Mukteswar and in Mysore with negative results so far.

Again the indefinite insidious course of the disease, its long incubation period, absence of a uniform method of diagnosing the cases in the earlier stages and failure of all attempts to cure the disease, constitute difficulties in the control of Johne's disease in India as elsewhere.

Among the control measures, an accurate knowledge of the incidence and spread of the disease in India at present is very essential. Towards this end, a systematic survey should be undertaken simultaneously in the several provinces and Indian States on a comprehensive questionnaire and the disease included among the " scheduled " diseases.

Secondly, measures to check the spread of the disease should be directed towards the following :—

(a) Maintenance of the vitality and power of resistance of the animals by balanced ration and the addition of mineral supplements.

(b) Providing hygienic environment by proper sanitation, disposal of dung, burning of contaminated manure, and prevention of contamination of drinking pools, etc.

(c) Immediate isolation, elimination and destruction of all clinical cases.

(d) Periodic testing of the herds with a potent Johnin and elimination of reactors.

(e) Notification of infected localities to prevent traffic of infected animals, especially, sales from dairies of animals declared to be suspected should be stopped.

(f) Treating the infected pastures with quick lime at the rate of 1 to 2 tons per acre.

(g) Education by propaganda of live stock owners, and others interested regarding the nature and importance of this disease.

In concluding, it may be suggested that a more intensive research work on the nature and behaviour of the bacillus, preparation of suitable serum and vaccine, and curative measures, are called for with a view to evolve satisfactory methods of controlling the disease which has not by any means yet received that amount of attention warranted by its possible menace to the live Stock Industry in India.

SUPPLEMENTARY NOTE ON SUBJECT No. 3

BY

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For the control of any disease the first and the most important thing is a correct diagnosis. Johne's disease is very insidious and it may take years before clinical symptoms are manifested. Unless the existence of this disease is diagnosed at the outset it is useless to attempt its eradication. Animals infected with disease void the infective agent in their fæces and thus infect other animals and the surroundings before they themselves show any pronounced symptoms of the disease.

The methods employed for the diagnosis of this disease are :—

(1) The Avian tuberculin or Johnin test ;

(2) Microscopical examination of fæces ;

(3) Microscopical examination of rectal mucous membrane smears,

(4) Examination of bowel washings ;

(5) Clinical symptoms ; and

(6) Post-mortem examination.

By the first method one gets an idea of the extent of the infection in a herd though these tests are not always infallible. The other methods are confirmatory and one or all may have to be used for a confirmation.

After having established the existence of the disease in a herd or a particular locality the next step is to check its spread and finally attempt complete eradication. Prevention is the only cure for this disease.

The following methods may advantageously be used for the control of this disease :—

(1) Educate stock owners to recognise the nature and gravity of the disease and enlist their co-operation. Unless and until the stock owners realise the danger of this disease and are willing to co-operate with the Veterinary authorities in its eradication, it is impossible to progress far.

(2) Carry out tuberculin tests periodically at least twice a year to commence with. As a result of these tests the herd can be divided into three groups. (a) The positive, (b) doubtful and (c) negative. The positive reactors after confirmation by other methods mentioned under diagnosis should at once be removed and destroyed if possible (this is difficult in India if the animals happen to be female), or strictly isolated till they die. The doubtful reactors should be segregated and tested again and if confirmed treated in the same way as above. The negative reactors should be removed to an uninfected area and tested again after an interval of three to six months. There may be a few cases of reactors even in these subsequent tests if the infection

was in the herd for a long time. Thus all the infected animals can be removed from the herd and a clean herd established in due course on the same lines as tuberculosis free herds are established in Western countries.

(3) No animal should be introduced into a healthy herd without a knowledge of its full history. All new additions should be kept under observation for a period and should pass the ' Avian ' tuberculin test.

(4) Indiscriminate movement of cattle should be restricted especially from an infected locality. The innumerable cattle fairs in India are a source of danger of spreading the disease.

(5) The dung and other materials such as bedding, etc., which come in contact with the infected animals should be burnt.

(6) Animals losing in condition in spite of good food and showing intermittent diarrhœa should be watched with suspicion and the usual tests applied. Diarrhœa and wasting due to helminthic infection and also due to tuberculosis should be excluded.

(7) Infected pastures should not be allotted for the grazing of healthy animals. Such pastures should be ploughed up. Lime dressing as recommended for other infections of pastures is not of much use, as the infective organism is an alkali-resistant one. Infected watering troughs and ponds also should be avoided. These should be dried up and disinfected. Similarly sheds where infected cattle were housed should be thoroughly cleansed.

(8) Animals should be kept under proper hygienic conditions and on a well balanced diet. Mineral feeding may help in raising the disease resistance of a herd in general.

(9) *Vaccination.*—Vallee and Rinjard's method of vaccination against this disease is being carried out in France and some other countries with success. This method of vaccination is under experiment in the Mukteswar Johne's herd.

(10) Goats and sheep are also susceptible to this disease. This should be kept in mind while attempting control measures.

NOTE ON SUBJECT NO. 4.

CONTROL OF DOYLE'S (RANIKHET) DISEASE IN INDIA

BY

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Before proceeding with the subject proper of this paper, I would like to place on record a few facts regarding the discovery of this disease in India, which, I have not seen reported. This disease appears to have been reported for the first time by Dr. Edwards in 1928 but it was Shirlaw who originally worked on the disease at Ranikhet in the monsoon of 1927, which later on came to be called " Ranikhet disease ". I happened to be at Mukteswar at the time when Shirlaw was deputed un-officially by Dr. Edwards to investigate a disease at Ranikhet where some retired military officer had suffered heavy losses amongst his poultry flock. Shirlaw after considerable work came to the conclusion that he was dealing with virus disease and, if I remember aright, suggested the similarity between the disease he was dealing with and the New-Castle disease. I think it proper to place these facts on record for I fear that Shirlaw has not got sufficient credit for his work in this connection.

Coming to the subject proper of the paper I must admit at the outset that much to the disappointment of the veterinary workers the world over we have to admit our failure in having evolved a satisfactory method of combating the disease. It is to bring home to the research worker the urgent necessity of evolving successful control measures that this paper is being submitted. With lack of almost any weapon of defence the field worker finds himself in a predicament when confronted with quickly vanishing flocks of poultry and irate owner. The disease as is well known is very fatal and in many instances flocks have been completely wiped out. It is, therefore, no wonder that this knowledge has kept back many an enthusiast from breeding poultry to the detriment of the industry.

In India as elsewhere no satisfactory sera or vaccine has been prepared that can be used in the field and consequently attempts at empiric treatments have been frequent, in some cases with claims of success that have not been substantialised.

Naik in 1936 reported favourably on subcutaneous or preferably intravenous injection of a 1 per cent. trypan blue solution in 1 to 3 c.c. doses, but field trials in this Province (Bihar) by Sahai [1938] did not confirm his results.

At the Patna Laboratory injections of trypan blue, saturated solution of magnesium sulphate and antimosan, oral administration of camphor and alcohol and tincture lobelie ætheris failed to prevent or cure artificially induced disease. Similar attempts with iodine, potassium permanganate, injections of formaline and Lugol's solution by different workers have had no better fate.

An attack of this disease confers immunity on the recovered birds and it was hoped that an immunising agent would soon be evolved but so far the

results have been disappointing. Heat Killed virus and formalised virus [Doyle 1927], have proved unsatisfactory. Serum from recovered fowls [Cooper 1927] though efficacious is not practicable. At Mukteswar attempts by treating tissues with chloroform, formaline and desiccation have given negative results. At the Patna Laboratory attempts to make an immune serum from goats, vaccine from tissues of guinea fowls, dilutions of the virus, treatment of tissues (spleen, liver, brain of birds) with Yattren, and by absorbing the virus on aluminium hydroxide have all failed.

Picard's [1934] attempts at production of a vaccine by grinding the virulent tissues and subsequently treating with sodium chloride (9 per cent.) have had a similar fate.

It is therefore evident that except for hygienic measures the field worker has nothing else to lay his hands on in his fight against this dread disease.

This has been a tale of disappointments but I trust in this to have focussed the attention of the research workers to the urgent need of investigation into poultry problems.

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NOTE ON SUBJECT No. 5.

PRESENT POSITION REGARDING THE CONTROL OF SURRA IN HORSES AND CATTLE IN THE PUNJAB

BY

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The object of this paper is to review briefly the results so far obtained in the treatment of surra in the Punjab and also to offer tentative suggestions as to the line of work to be followed in future in controlling the disease.

The essential factors that are borne in mind for the contral of surra are :—

(1) Chemo-therapeutic agents capable of effecting a cure.

(2) Chemical agents capable of protecting the animal against infection.

(3) Determination and destruction of the transmitting agents.

In dealing with the different aspects of the subject, I shall confine myself to the experience we have had in dealing with this disease in the Punjab.

1. *Chemo-therapeutic agents capable of effecting a cure.*

The history of surra reveals that a considerable number of drugs have been tried in the treatment of this disease. The advent of Bayer 205, however, eclipsed all other remedies by virtue of its slow trypanocidal action and its remaining in the circulation in trypanocidal concentration for long periods. This drug was tried in the Punjab in 1924, as recorded in a report on surra in the Punjab (1934). In 1926, it was used in conjunction with Tartar emetic on a large scale in the field and the results obtained were on the whole satisfactory. The long course of this treatment, however, adversely affected its popularity. The necessity was therefore felt of discovering a single-curative and prophylactic dose of Naganol. Subsequently it was found that treatment with a single dose of 4 grams. Naganol was as effective as a full course of Naganol *cum* Tartar emetic extending over a period of a month, and that the results chiefly depended upon the stage of the disease in which the animals were subjected to treatment.

The cases treated for surra during the last five years are detailed as below :—

Year.	No. of cases.			Remarks.
	Equines.	Camel.	Total.	
(1) 1933-34	2,867	3,674	6,541	(*a*) Including 3 dogs and one buffalo.
(2) 1934-35	(*a*) 3,031	4,370	(*b*) 7,401	(*b*) 1157 cases were treated with single injection of Naganol.
(3) 1935-36	(*c*) 1,321	2,352	3,637	(*c*) Includes 3 dogs and 5 bovines.
(4) 1936-37	(*d*) 1,094	2,668	3,762	(*d*) Includes 8 others.
(5) 1937-38	(*e*) 1,226	2,672	3,898	(*e*) Includes 37 others.

In addition to the cases which are treated at Surra centres, a certain number of outbreaks of acute cattle surra are, from time to time, treated with Naganol, but the cost of this drug prohibits its use on a large scale. The field control of cattle surra with a view to prophylaxis therefore becomes a great problem. The Department has saved, nevertheless, stock-owners from many losses. The decrease in the number of surra cases during the last three years is attributed more to scanty rainfall, as it is very doubtful whether curative efforts can have any appreciable effect on the incidence of Surra as long as the reservoirs and transmitting agents continue to exist.

2. *Chemical agents capable of protecting susceptible animals against infection, natural or artificial.*

There is only one drug, Naganol, at our disposal which indicates that it possesses some prophylactic value.

In India, Edwards (1926), as a result of his experiments, was the first to suggest the possibilities of Naganol as a prophylactic agent against Surra. Probably from this suggestion the Civil Veterinary Department, Burma, conceived the idea of conducting their experiments with Naganol. This work confirmed the findings of previous workers.

In 1933-34, an experiment on a small scale, the details of which were worked out by Messrs. Taylor and Shirlaw, was carried out under the control of the district staff to determine the prophylactic qualities of Naganol under field conditions. In this experiment, 52 healthy horses were chosen from amongst 617 in 13 selected villages. Out of those which were protected by the injection of this drug intravenously, only two cases of Surra occurred, whilst amongst the remainder 120 contracted the disease. The results were clearly hopeful.

The experiment was continued during the year 1934-35. The results of these investigations indicated the necessity of further work on the subject. Consequently 220 horses weere selected from Gujranwala and Sheikhupura Surra centres in 1935-36. These were divided into three groups as below .—

(1) 88 horses. Each horse received 1 gram. of Naganol monthly for six months from July to December 1936.

(2) 44 horses. Each horse was injected intravenously with 2 grams. of Naganol monthly for six months.

(3) 88 horses. Each horse received 2 injections intravenously of 3 grams. of Naganol every third month.

For control purposes nearly half the horses of each village from where the experimental animals were selected were left unprotected. All of the experimental horses in the three groups remained free from Surra throughout the Surra season whereas some of the control animals contracted the disease. These experiments seemed to indicate the value of Naganol as a Prophylactic agent, but no definite conclusions could be drawn as the incidence of Surra in the villages where the experiment had been conducted was not expensive. It is, therefore, necessary to obtain further information regarding dosage, and the interval between the injections by conducting more extensive experiments under laboratory and field conditions.

3. *Determination and destruction of the transmitting agents.*

Trypanosoma evansi, as far as we know, has no intermediate host and the transmitting agent is merely a mechanical carrier of the disease from the infected to the healthy.

The bulk of evidence [Leese, 1909 ; Leese, 1912 ; Cross and Patel, 1921 ; Cross, 1923] inclines to Tabanids as being the main transmitting agents. There is no doubt that the major part played in the transmission of Surra is by the latter, but other blood sucking and biting flies cannot altogether be excluded from the list of transmitting agents.

In view of the above, the present position regarding the control of Surra in horses and cattle in the Punjab can be summarised as follows :—

(*i*) Surra in horses and Cattle can be cured both by Naganol alone and Naganol-cum-Tartar emetic method provided the cases are submitted for treatment in the early stages of the disease.

(*ii*) Further experiments under field and laboratory conditions are necessary to determine the prophylactic properties of Naganol.

(*iii*) Further research is also necessary to determine and eradicate transmitting agents.

NOTE ON SUBJECT No. 6.

A REVIEW OF THE PRESENT POSITION IN REGARD TO THEILERIASIS OF CATTLE IN INDIA.

BY

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Theileriasis is a disease produced by the presence of a protozoan parasite in the blood and is so far known to affect only sheep, goats and cattle. The occurrence of this disease condition, as distinct from red water (*B. bigemina* infection), amongst Indian cattle, was for the first time reported by Edwards in 1925, when a protozoan parasite conforming with the description of *Theileria mutans* was seen by him to occur in hill bulls at Mukteswar. Closely following these observations Cooper described certain structures in the lesions of hill bulls that had died after inoculation with rinderpest virus. According to him these structures were indistinguishable from Koch's blue bodies, the lesions themselves presenting a close resemblance to those of East Coast Fever. During the fourteen years that have elapsed since these findings were made, acute cases of theileriasis have been of fairly frequent occurrence among imported bulls in India, although both in respect of clinical symptoms and *post-mortem* appearances they have shown a range of variation which has made it a matter of considerable difficulty to refer them with certainty to any of the recognised forms of theileriasis. Briefly, the symptoms of the Indian form of acute theileriasis among imported bulls may be described as follows: Temperature high (105°-107°F.) at the beginning, but later erratic, with the appearance of the parasite in the circulating blood ; profuse lachrymation, and watery discharge from the nostrils ; inappetence and progressive loss of condition ; swelling of the superficial lymphatic glands ; visible mucous membranes icteric, and diarrhœa in a small proportion of cases. In some instances the parasite has been observed to make its appearance in the peripheral circulation at a late stage of paroxysm (on the seventh day). In one outbreak the condition was, to all appearances, a chronic form of theileriasis, as was evidenced by the history of some of the affected animals. Thus, in one instance, the disease, after running an indifferent course, with periods of prolonged absence of any clinical symptoms, suddenly assumed an acute form and progressed to a fatal issue after lasting for only one or two days. The examination of blood smears from the affected animals in natural cases, however, have shown, as a rule, the presence of only rare theilera parasites and Koch's bodies. The mortality rate has been found to vary from 25 to 30 per cent. It is of interest that in the course of routine blood smear examination at the Mukteswar Institute, evidence has also been obtained of the fact that an infection due to a theileria parasite, other than the innocuous *T. mutans*, is of not infrequent occurrence among indigenous cattle in India.

An opportunity for studying the disease under controlled conditions occurred in 1932 when a strain of the parasite was successfully isolated from an infected hill bull destroyed *in extremis*. This strain has now been kept alive for the past seven years by " passaging ", a total of not less than 900 bulls

having been so far utilized in this work. The symptoms observed in the artificial infections have been fully described by Sen and Srinivasan in a paper published by them in 1937. They are briefly as follows :—

> Temperature high ; progressive inappetence ; enlargement of prescapular and precrural glands ; visible mucous membranes of the eyes showing icterus and petechiae ; lachrymation ; flow of saliva and catarrhal discharge from the nostrils ; Koch's bodies demonstrable at an early stage of the disease.

It is noteworthy that while these symptoms have thus been generally similar to those observed in the natural cases of the disease among imported animals, no evidence of chronicity has so far been obtained in any of the numerous artificial cases studied by them or by the present writer. On the other hand, the occurrence of frequent Koch's bodies and a high mortality rate (76 per cent.) have invariably been found to be the two constant features in these cases, while this has not been so in the natural outbreaks amongst imported bulls as already mentioned. The present position in regard to this disease therefore continues to be one of inquiry concerning the possibility of the existence of a plurality of the strains of Theileria parasites in this country. It may, however, be declared with a fair degree of certainty, on the basis of observations so far carried out at Mukteswar, that the acute form of the disease as it affects hill bulls in the Kumaun, is caused by a single species of Theileria parasite which, although tentatively regarded as *T. annulata* (*T. dispar*), may in realite be a variant of *T. parva* ; but of depressed virulence. This was evidently the possibility which Wenyon had in mind, when he reported the occurrence of East Coast Fever in India (Protozoology, 1926). The question of the identity of these two forms of theileriasis, however, can only be settled, with any degree of certainty, by means of a series of carefully controlled cross-immunity tests and it is presumably with this object in view that the Kenya Veterinary Department have recently addressed us concerning the possibility of supplying that Department with an Indian strain of Theileria parasites. How far similar experiments could be undertaken in India, with due regard to the possibility of the introduction of East Coast Fever in this country, is a matter which would appear to merit consideration. On the other hand, it has been postulated that the Indian form of acute theileriasis may be merely due to a virulent variant of the innocuous *T. mutans*, which is of common occurrence in the blood of cattle of indiginous breeds. The experimental evidence, so far available, does not, however, appear to lend support to such a possibility. Thus, *T. mutans* chiefly inhabits the red blood corpuscles, where propagation takes place by the simple division of the parasite into four ; whereas in *T. annulata* propagation takes place in the cytoplasm of the mononuclear leucocytes by means of schizogomy (Schisonts are known as Koch's bodies). Also the ratio of ring to rod or bacillary form is about 45 to 55 per cent. in *T. mutans*, while in *T. annulata* 80 to 90 per cent. of the parasites which invade the red blood corpuscles are round.

The fact that after recovery from the disease the animals developed a solid and sterile immunity suggested the use of anti-theileriasis serum in the curative treatment of the disease. Four brews of anti-theileriasis serum, bled at different periods of reaction, were involved in testing the potency of one against the other, and the results obtained so far point to the conclusion that the opti-

mum period for bleeding for potent serum is the stage following the complete or almost complete disappearance of the parasites from the circulating blood of the donor. Recoveries amounting to 63·6 per cent. have been obtained from the use of this brew in the treatment of experimental cases of theileriasis at the Mukteswar Institute. Consignments of this product have also been supplied to Army Veterinary Department for use upon natural case of acute theileriasis in imported bulls and the results are being awaited. A total of about twenty drugs have also been tested as to their efficacy for this condition, but the results have for the most part been unsatisfactory, the maximum number of recoveries (57·8 per cent.) having been obtained with the proprietory remedy Atebrin (Sen & Srinivasan, 1937).

In view of the fact that the intraleucocytic habit of Koch's bodies in theileriasis presents a close resemblance to that of Leishman-Donovan bodies, it is now proposed to undertake a series of trials with Amino-Stiburea (the well known specific for Kala-azar) and other drugs of Sulphaniline group in the treatment of this condition.

NOTE ON SUBJECT No. 7.

THE APPLICATION OF THE RESULTS SO FAR OBTAINED IN THE CONTROL ON THE BIONOMICS OF THE WARBLE-FLY FOR THE INQUIRY OF THIS PEST.

BY

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At the First Meeting of the Animal Husbandry Wing held at New Delhi in 1933, a recommendation was made urging the necessity of undertaking an inquiry into the regional distribution and seasonal prevalence of the Warble-Fly in India (*Proceedings*, p. 31), for it was realized that the acquisition of precise information on these two points was an essential preliminary to the formulation of combative measures against this pest. The importance of this information was again stressed by the present writer when the subject of grading of hides and skins came up for discussion at the Second Meeting held at Madras in 1936 (*Proceedings*, pages 51-52), for, as was pointed out by him, the life-history of the Warble-Fly in India might differ in essential points from what is known about it in other countries.

An inquiry into the life-history and bionomics of the Warble-Fly has now been in progress at the Imperial Veterinary Research Institute, Mukteswar, for the past two years, under a research scheme sanctioned by the Imperial Council of Agricultural Research, and it will be the object of the present note to examine the extent to which the results so far obtained in the course of this inquiry may be expected to lend themselves for application for the control of this pest.*

The present inquiry has, in a large measure, been directed to obtaining confirmation of the generally accepted view that, while the fly is widespread in comparatively dry and arid areas, it is of rare occurrence in the moister localities. It may be stated at once that the results of Warble-Fly surveys so far carried out in certain Provinces and Indian States have shown this view to be substantially correct. Thus, while the pest is of common occurrence in the North-West Frontier Province, the Punjab and the greater part of the United Provinces, no warble tumours could be detected in any out of the 178 head of cattle examined on the Government Farm, Dacca (Bengal), during January 1938, although this is about the month when the tumours are most frequently encountered in the localities where the pest is known to be prevalent. It is, however, of interest that reports of the occurrence of the pest have been received from the hilly areas of Kalimpong and Chittagong, and, according to available information, the incidence of the infestation in the latter area amounts to about 30 per cent. Only a few cases of Warble-Fly infestation have so far been reported form the adjacent provinces of Bihar and Orissa and none from the province of Assam. A survey carried out, during November 1938, at Ernakulum and Coimbatore in the Madras Presidency and also in Hyderabad State failed to disclose the presence of *Hydpoderma lineatum* in any of these areas. According to information supplied by one of the principal

* The writer is indebted to Mr. B. N. Soni, B.Sc. (Punjab and Edin.), Entomological Assistant, Warble-Fly Inquiry, for furnishing him with the data on which this note is based.

tanning agencies in the Madras City, the pest is practically unknown in that province, although a considerable amount of damage is done to hides by ticks. During the same month, an examination was made of eighty cows belonging to the Palace Dairy at Trivandrum and out of these, twelve—all imported from Sind four months previously—showed warble tumours on their backs. It is, however, unlikely that the pest would obtain a footing in the soil of Travancore, in view of the fact that no evidence of infestation was obtained in any of the local breeds of cattle or even in any of the several cows that had been imported there from Sind during the preceding four years. On the other hand, there is some evidence to show that the infestation is prevalent in an endemic form in the Nilgiris—a fact which is of more than ordinary interest in view of its reported prevalence in certain hill tracts in Bengal, as already mentioned. It may be remarked in parenthesis that the Ox Warble-Fly has also been found to be indigenous to Mukteswar (altitude 7,500 ft.), while Bishopp and his collaborators (1926), working in the United States of America, likewise refer to the fact that the grubs " thrive admirably in fairly high altitudes ".

Apart from the immediate practical utility of the foregoing observations in indicating the localities where control operations will have to be organized, one can hardly over-estimate their possible significance in relation to the question of formulating hypothesis concerning the ecological factors most favourable to the development of the pest. The remarkable concentration of the flies in certain well-defined areas would appear to be suggestive of the existence of a definite climatic barrier operating against their unrestricted spread, and it is almost needless to say that a knowledge of the precise nature of this barrier would make the undertaking of a country wide Warble-Fly survey largely superfluous.

While from the point of view of the original distribution, the Warble-Fly problem in India does not thus appear to be of a magnitude that is likely to necessitate the organization of a particularly large-scale campaign for the control of this pest, the problem assumes an entirely different position when considered from the point of view of the seasonal prevalence of the fly, for this has been found to vary, within wide limits, with local conditions and altitude, so that any schedule of combative operations will obviously have to be drawn up with due regard to such variation. Thus, while at Mukteswar, the grubs continue to emerge from their hosts until the early part of March, no warble tumours are reported to have been observed at Hissar (Punjab) after the middle of January. Again, in the plains of the North-West Frontier Province, the earliest batch of larvæ were observed to leave their hosts during the middle of February, while in the hills this occurred a fortnight later. Some evidence is also available to show that, within the limits of the same locality, the seasonal occurrence of the pest may vary from year to year, depending, in all probability, on variation in conditions of temperature and rainfall.

What has been said above applies exclusively to the Ox Warble-Fly, *H. lineatum*. The position in regard to the Warble-Fly of goats (*H. crossii*) presents a substantially different picture both in respect of the regional distribution and seasonal prevalence of this pest. Thus, *H. crossii* is of much greater abundance than *H. lineatum* in the Salt Range area of the Jhelum district (Punjab), where not less than 85 per cent. of goats of the " Barbary " breed

were found infested during the month of March 1937. Similar remarks also apply to certain localities in the North-West Frontier Province. In Kashmir, *H. crossii* was the only species of Warble-Fly prevalent during the early part of October 1938, although, according to unconfirmed reports, a certain percentage of cattle in this State usually show warble tumours on their backs during the latter part of November and during the months of December and January. Likewise, not one out of the numerous head of cattle examined in the Kangra Valley, during June 1938, showed evidence of Warble-Fly infestation, although the tumours were common in a local breed of goats.

A point of considerable interest that has emerged in the course of the surveys referred to above is the occurrence of warble tumours in goats during a continuous period of nearly seven months (as against four months in the case of cattle), this, it would appear, being due to the fact that, in the case of *H. crissii*, the whole of the larval development is accomplished in the subcutaneous tissues of the host, without the occurrence of a stage of migration between any of the successive instars. Under field conditions, it may prove to be of actual advantage to have to deal with protracted infestations, for this would make it possible with a small staff to carry out the dressing operations in relatively large herds or in a succession of infested localities widely separated from one another. The variation in the seasonal development of the larvæ of *H. lineatum*, as referred to earlier in this note, may likewise be turned to advantage in drawing up suitable itineraries for the application of control measures against this pest. For the determination of the exact range of this variation, however, it will obviously be necessary to enlist the co-operation of the Veterinary Departments in the localities where the pest is prevalent.

NOTE ON SUBJECT No. 8.

DEVELOPMENT OF PEDIGREE REGISTRATION AND MILK RECORDING

BY

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Introduction.—Of the many measures required for the development of cattle breeding industry Pedigree Registration and Milk Recording are the most important. These are in fact the foundations on which cattle industries have been built up in all countries of the world which have been successful in the economic exploitation of their livestock. The importance of these essential factors have been realised, though empirically, from times immemorial, and references to the selection of good parent animals for breeding purposes are available in the works of ancient Greek and Roman authors. Written records, however, came into existence only about the middle of the 17th century and even then these related to the sheep and horse breeding industries, only. Cattle breeding industry did not acquire an independent status till about the beginning of the 19th century, and true scientific foundation for the modern Herd Book cannot be said to have been laid before the middle or the latter half of that century. The influence of the current theories about heredity and cattle breeding are discernible in the technique and organisation of Herd Books of each period. In fact these theories and the contents of the Herd Books have always acted and reacted on each other. The rediscovery of Mendel's principles of Heredity and the scientific studies of the records gave a considerable fillip to the Herd Book movement in the beginning of the 20th century. The modern Cow Testing Associations also came into existence about that time, and the remarkable rapidity with which the movement has developed during the last thirty years is perhaps the best index of the growing realisation of the value and utility of these records. Indeed from the data published by the International Institute of Agriculture it is perhaps safe to generalise that cattle breeding industry has advanced most in those countries which have taken the most rapid strides in pedigree registration and milk recording.

Importance of Recording : An Illustration.—A concrete illustration would serve to show what a rapid development in milk recording might mean to a Country's Cattle Industry. Denmark which is perhaps the greatest supplier of butter to world markets provides the best example.* The first Cow Testing Association in the world was started in Vojens, Denmark on 1st May 1895 on the initiative of a lady with 12 members. Ten years later Denmark had nearly 300 associations with about 7,000 members and 112,000 cows under test. Ten years later in 1915 there were 610 associations. In 1925 the number exceeded a thousand and in 1934 there were 1,579 Cow Testing Associations with 48,948 herds consisting of 678,402 cows under test. This figure represents about 40 per cent. of the total Dairy cows in Denmark. In

*Zal R. Kothavala ; Second A. H. Wing, *vide* page 186 of Proceedings.

other countries with less phenomenal development in milk recording the corresponding percentages of milk-recorded cows to total cow-population are :—

	Per cent.
Finland	18
Newzealand	17
Sweden	15
Scotland	13
Germany	11
England	7·3

There are areas in Denmark where as many as 70 per cent. of the cows are milk-recorded. Coordination between Pedigree and Performances is ensured by requiring that milk yield qualifications for entry in Herd Books shall be based on the records of the Cow Testing Associations. How far the Dairy Industry of Denmark has advanced during these years of growth in recording can be gauged from the fact that whereas in 1881 the average annual production of the Danish cow was 110 lbs. fat and total annual export of butter from Denmark 26 million pounds, the corresponding figures in 1934 were an average yield of 298 lbs. of fat and an export of 330 million pounds of butter.

It is necessary to explain that phenomenal as this increase in the national asset is, the amount of the increases should not be taken to be the face value of the enhanced amount of butter sold. A much larger increase is in the capital value of the livestock. This increase again is not limited to the 300 per cent. rise that has taken place in the level of production, but extends to the improved economic efficiency of the animals and the breeding value of the guarantee which recorded pedigrees afford.

Uses and Advantages of Recording.—Incidentally it may be interesting to examine what the uses and advantages of Pedigree Registration and Milk Recording are which help the cattle breeding industry so much. These are many and varied. The first and foremost consideration in breeding work is the proper choice of parents. A carefully maintained system of pedigree and performance records enables the breeder to make his choice in accordance with well-known principles of heredity. This again helps him to cull uneconomic producers from the herd early in their lives before money is wasted on their feed and keep. It points out to him the cows from which calves should be kept for replenishing the herd. Judicious and economic feeding according to scientific requirements, correction of faulty feedings, and the check of total production, sales and home utilisation which frequently reduces waste, are also not possible without accurate milk records. These also increase the enthusiasm of milkers and in the keenness to maintain production milking is more efficient and strippings are more thoroughly done. Cows and heifers can be sold with a certificate of production and it is the universal experience

that when accompanied by certificates the animals fetch higher prices. Capital value of bulls and bull calves is increased, because it is only through milk records that their transmitting ability can be assessed. Milk records can also be utilised for grading up non-pedigree to pedigree stock.

An advantage of a different kind which records provide is the opportunity they offer to the scientific study of the many problems which confront the breeder and the dairyman. As far as future developments are concerned this is the most important function of milk and pedigree records. There is a considerable volume of literature relating to these studies in the past few years and the changes in methods and practice introduced in the light of the knowledge thus unfolded are to a great extent responsible for the improvement that has taken place in the industry.

Agencies for Recording in Other Countries.—In other livestock countries of the world Pedigree Registration and Milk Recording are carried out by organisations which are either managed or supervised by Governments. These were started with small beginnings, generally with the efforts of a few individuals, and later grew to their present dimensions through public and government support. Even in the same country the details of their working and the scope of their functions vary to a greater or less extent but an essential uniformity is achieved through governmental supervision. Variations from country to country are very wide, so much so that it is found that the data furnished by the records in different countries are found to be not comparable. In order to make these comparable an International Convention was established in 1936 which laid down regulations for the standardisation of the keeping and operating of Herd Books. This Convention will be referred to in greater details in a subsequent section.

Recording Work Done in India :

(*a*) *Provincial Governments.*—In India no organisation of this kind exists and general registration and recording work is not carried on on a large scale. The limited amount of work done in this direction is confined almost entirely to Government Departments. Each Province has a few farms of its own run by Government where small number of animals are bred, and their records maintained. The bulls available from these farms are given to approved breeders on some sort of premium system for service in villages. The supply from the farms is often supplemented by purchases from outside when bulls of the required type are available. In certain Provinces the progeny of these bulls are registered. The position is improving gradually owing to the personal

*In describing the advantage of milk recording F. H. Garner (Dairy Shorthorn Journal, October 1936) quotes the figure that whereas official milk recording costs the farmer an average of only 4/3 per cow in money and a little extra time and labour, the increase in the value of his herd may well be £5 per head of all cows and heifers, and it may double, and in some cases treble, the value of bull calves shortly after birth.

Limited as the registration work done in India is we have sufficient instances of marked increases in price fetched by registered animals. To take a few examples it is reported from Bombay that village animals registered in the Government Herd Books command on an average 75 per cent. higher prices than similar animals which are not registered. In two auctions held at the Government Military Dairy Farm, Ferozepore, in 1922 and 1923, prices ranging from Rs. 200 to Rs. 800 were realized for bull calves a little over one year old. There is considerable demand for such registered animals not only in India but from other tropical countries, and one of these has recently offered as much as Rs. 2,400 for a Pusa Sahiwal pedigree bull.

interest taken by His Excellency the Viceroy in live-stock improvement and his emphasis on pedigree. As a result of this, Livestock Improvement Associations have already been started or are in contemplation in almost all Provinces, one of the results of which would necessarily be an improvement in the situation regarding pedigree registration. A suggestion as to how these organisations may be utilised to promote registration and recording is given in a later section.

(*b*) *Central Government.*—The Central Government have also a few farms under their control, where the main object is the preservation of some of the best strains available in the country. Regular and systematic records are maintained in respect of the animals in these Farms. The Military Dairy Farms (which, though owned by the Central Government, are run on commercial lines) of which there are several scattered all over the country also do a considerable amount of registration and recording work in respect of animals owned by them. These are probably the pioneers in the field of registration and recording in India on modern lines.

(*c*) *Imperial Council of Agricultural Research* :

(i) *Pedigree Registration.*—From almost its very inception the Imperial Council of Agricultural Research realised the need for Pedigree Registration and Milk Recording and the subject has been considered at a number of meetings of its Committees. It has been decided that pedigree Herd Books should be started and maintained by the Council in respect of dairy cattle of all-India importance. As a preliminary step to this seven all-India breeds were surveyed and their characteristics defined. These definitions will shortly be issued in the form of a brochure,* whereafter Herd Books will be opened in collaboration with the Provinces most concerned with the seven breeds.

(ii) *Milk Recording.*—Milk recording has also received equal attention. With the active co-operation of Provinces schemes have already been sanctioned for the formation of Milk Recording Societies in the home of the various breeds selected for Central registration. It is hoped that the nucleus societies so started under the auspices of the Council will be taken on by the public and will, in course of time, supply a long felt want.

(iii) *Publication of Milk Records.*—In the meanwhile, the Council decided to make a start with the publication of the records already available in some of the Government and private dairies in India. These are not officially tested milk records in the sense in which they are understood in other countries, but are records which in the opinion of the Council are systematically maintained and which are subject to surprise checks by the representatives of the Council. The first instalment of these records has already been issued as Miscellaneous Bulletin No. 18 of the Imperial Council of Agricultural Research.

(iv) *Studies of Milk Records.*—In a previous section it was observed that one of the advantages of keeping records is the opportunity they afford for the study of problems relating to cattle breeding and dairying. This part of the function of recording has been fulfilled by the Imperial Council of Agricultural Research to a large extent by the appointment of a nucleus

*I. C. A. R. Misc. Bulletin No. 27 (in the Press).

staff for the establishment of an Animal Husbandry Bureau, one of whose functions is the study of such records as exist. This nucleus has been in existence now for over six years, and a number of problems relating to dairying and cattle breeding has been investigated and the results published. This work is being continued, and a large volume of information of very great utility to the breeder and the dairyman is being collected and recorded.

Propaganda Necessary in Favour of Recording.—Apart from the serious handicap of cattle breeding being in the hands of small owners who are generally both poor and illiterate there is a general lack of appreciation in India of the value of recording. A considerable amount of propaganda is required in this direction, and nothing will be so effective as the actual demonstration that the animal accompanied by a certificate of production and descent fetches a higher price than another without the certificate. The Provincial Livestock Improvement Associations or Boards which are either contemplated or already in operation in most provinces can do a good deal in this matter by emphasising the value of records. A fruitful line of advance in this direction, which in the opinion of the writer would have far reaching effects, is through the organisation of milk collecting centres at suitable places.

Organisation of Milk Collecting Centres is the Best Form of Propaganda for Recording.—To begin with an area with a good production of milk may be chosen in *each District* preferably near a town or other consuming centre and in the locality where premium bulls are working. A shed may be erected in a convenient place where the villagers may be persuaded to tie their cattle and milk them. The Association should arrange for the collection and efficient marketing of milk. A paid servant may be employed, who will get the cows milked in his presence, record the yield and arrange to take the milk away for disposal. This ensures automatic recording. A suitable bull should be made available for service and arrangements made for a purchase of cattle feeds and their supply to the villagers at wholesale rates. Suitable mixtures of rations may be framed, each cow given its actual requirements, and the cost of the ration deducted from the payment for milk. As time goes on the activity at each such centre may be expanded. The cows and their accredited progeny may be marked and registered, and certificates issued to the owners when the animals change hands. Free protection may be given against Rinderpest and all measures necessary for the improvement of cattle may be gradually introduced.

The above is only a bare outline for a beginning to be made. The working may be done by the Provincial Livestock Association or co-operatively. It is preferable that to begin with, the scheme is worked directly by the Association and eventually when people have realised the value of the work it may be left to develop on co-operative lines. The formation of such an institution and its success require initiative, technical advice and able guidance. As the Provincial Livestock Associations are started under Government auspices and have among its members the permanent officials connected with livestock improvement they are eminently suited for initiating and developing work of this kind.

In the present conditions in India any scheme of improvement will have a reasonable chance of success only if the beginning is made at the marketing

end, *viz.*, the producer is first enabled to obtain a more economic return for his produce. If this is done first, he is in an agreeable frame of mind and imbibes all the advice given to him. Each such centre can in course of time be developed into a milk recording or registration society.

Two Examples of Milk Collecting Centres at Allahabad and Trivandrum.— The wtiter is aware of work approximately on the above lines conducted at two centres in India, though Milk Recording and Pedigree Registration do not appear to be the main objective. One is at Allahabad and the other at Trivandrum. At Allahabad the Agricultural Institute has stations at one to six miles away where the *Gowallas* tie their cattle. At one of these stations there are one hundred milking cows and buffaloes. A paid servant of the Institute (on Rs. 15 per month) is stationed there. He is provided with a balance for weighing the milk and a special form for recording the yield of each animal. All the animals are milked in his presence, morning and evening, the milk is weighed and the yield recorded. Payment is made at the end of each week at previously fixed rates. The milk is separated on the spot, the cream is taken to the Institute and the separated milk sold back to the farmer at a nominal price or utilised for feeding some of the calves of the Institute. All these animals are served by a bull of the Institute Farm, and scrubs in the locality are castrated. In certain cases date of calving is not known, but a small premium is offered to those who bring their cows to calve at the station. Suitable mixtures of concentrates are prepared by the Institute and it is sold to the *Gowallas* at wholesale rates. The price of the mixtures is deducted from the weekly payment for milk. The *Gowalla* gets an economic return in ready cash at the end of each week and is free from the worries of marketing his produce.

At Trivandrum it is a Co-operative Milk Society outside the Municipal limits. Its name in Malayalam is " Thirumala Ksheera-vyavasaya Mahila Paraspara Sahaya Sanghom 1099 Ltd.", and it is run by women. The Society has 188 members at present and is formed with 200 shares of Rs. 5 per share. Loans are granted by the Society to the members for the purchase of cows. The cows are tied at the premises of the Society, they are milked there and the Society arranges for the disposal of the milk in the town. The amount of monthly instalments, by which the loan is to be repaid to the Society, is deducted from the payments for milk. The Society has also a co-operative store which supplies feeds for the cattle. The dividend earned by the members, amounts to approximately a pie per lb. milk sold by each.

An Institution like these can with suitable modifications be easily developed into a milk recording centre with great potentialities for the improvement of cattle.

International Convention : Neccssity for Co-ordination and Uniformity.— Mention has been made in a previous section of the lack of uniformity in the organisation and the technique of Herd Book keeping, which detract from the value of the records for international utilisation. The matter was considered by the International Institute of Agriculture and after discussion at a number of international Congresses, an International Convention was established on the 14th of October 1936, for the standardisation of the keeping and

operating of Herd Books. The Articles of this Convention are reproduced in the enclosure. Though India is not a signatory to the Convention, its provisions are of particular interest to her for two main reasons. She is now on the eve of starting official Herd Books and milk recording, and the Convention, representing as it does the accumulated experience of other countries of the world, points out the best line of advance. Secondly, India being the largest livestock country of the world both in numbers and in total value and as her cattle are in demand in other tropical countries she cannot expect to be able to take her proper place in the world or claim her due share of the international trade in livestock unless she develops on international lines and in conformity with the provisions of the Convention. For these reasons the terms of the Convention deserve special study by all those connected with the development of livestock in India. Special attention is invited to Article 11, which emphasises the necessity for proper co-ordination between Pedigree Registration and Milk Recording and for uniformity in the methods and principles of recording. It also follows that for development on these lines it is essential that the work of the various Provinces and States and the methods and principles followed in practice should be carefully co-ordinated. An attempt hass already been made by the Imperial Council of Agricultural Research in the direction of achieving uniformity by laying down a standard form of History and Pedigree Sheet to be maintained in Dairy Farms in India. This form has been actually tried in a number of Farms, and after considering their criticisms the Standing Cattle Breeding Committee recently approved of it with minor modifications. In connection with the scheme of publication of milk records, already referred to above, an attempt is being made to introduce this standard form in all Farms in India.

It may be noted that the Convention does not make any mention of the practice of suckling a calf by the lactating animals. In India weaning of calves at birth is rather the exception than the rule. Though various methods are in vogue for estimating the quantity consumed by the calf the practice of allowing the calf to suck makes the actual producing capacity of the dam a matter of conjecture. The interpretation of " Recorded yields " contained in the form of certificate appended to the Convention will probably have to be 'the weight of milk actually drawn into the pail '.

Enclosure.

Extracts from

INTERNATIONAL CONVENTION FOR THE STANDARDIZATION OF THE KEEPING AND OPERATING OF HERDBOOKS.

(ROME, OCTOBER 14, 1936)*.

Signatories.—Germany, Brazil, Bulgaria, Denmark, United States of America, France, Morocco, Tunis, Guatemala, Hungary, Italy, Latvia, Lithuania, Nicaragua, Paraguay, Netherlands, Poland, Switzerland, Czechoslovakia and Yugoslavia.

Preamble.—Considering the primary importance of Herdbooks for stock-breeding, alike from the point of view of breeding and from that of international transactions ;

Considering in particular the need generally recognised that there should be standardized on an international basis : (*a*) The general form of the Herdbooks ; (*b*) the methods adopted for the purpose of definitely establishing the identification of the animals registered, (*c*) the methods for recording the yields, and

Considering also that it is of the first importance to decide on the information which is to be compulsorily included in the pedigree and yield certificate required for international trade ;

Have decided to conclude a Convention for this purpose.

Provisions :

Article 1.

In principle, there shall be in each State one Herdbook only for a single breed.

Taking into account, however, special conditions, there may be allowed several Herdbooks. In the case where several Herdbooks are already in existence, the Government concerned shall make this known to the International Institute of Agriculture, in the case of a State signatory of the present Convention, within six months from the date of deposit of the deed of ratification, and for the States subsequently adhering to the convention, from the date of their adherence.

In the case where, in addition to the Herdbook or the Herdbooks already in existence for a single breed, there is to be instituted a new Herdbook, the above period of notification shall be six months from the institution of the new Herdbook.

In the case of the single Herdbook for breeds having different breed and aptitude characterictics, as well as for breeds distributed over an especially large area, which are therefore subject to different conditions of climate, habitat or nutrition, likely to produce differences in conformation, there may

*Only the French text is official. The English translation has been prepared by a Committee of English-speaking Delegates and of members of the staff of the International Institute of Agriculture.

be opened in the same Herdbook more than one Section corresponding in each case to a type of breed or to a region inhabited by the said breed. The situation of more than one Herdbook and the opening of particular Sections within the same Herdbook, shall be done only under the authority and under the supervision of the special body mentioned under paragraph (D) of the Protocol of Signature, attached to the present Convention for the organisation of the National Herdbook, and due notice shall be given to the International Institute of Agriculture.

Article 2.

All Herdbooks shall be arranged on identical lines and shall contain :—

(*a*) Register of births ;

(*b*) Final Register of males ;

(*c*) Final Register of females.

In connection with the Registers (*b*) and (*c*), there shall be entered all the information relating to each animal, results according to production records and prizes won by the animal, or by its ancestors, or by its offspring.

Article 3.

Besides the three Registers provided for in article 2 which shall be compulsory, the authorities in charge of the Herdbooks may establish an Advanced Register (Livre d'Or) or a Register of Merit (Live d'Elite), in which shall be entered those animals whose officially recorded yield has reached, in competitions as well as in the shed at home, a previously determined standard, fixed at a level considerably above the average. As far as sires are concerned, the entry in the Advanced Register or Register of Merit, shall be made on the basis of the yields of their daughters, and, if possible, of their sisters, determined in the same manner as indicated above for the registration of females.

There shall be mentioned not only the number of controlled female offspring, but also the number of offspring, male and female, entered in the Registers (*b*) and (*c*).

Article 4.

The opening and closing of Herdbooks being subject in each country to special and particular considerations, the regulations for initial entry shall become more severe and rigorous year by year as the date of the constitution of the Herdbook becomes more remote.

Article 5.

Until inspection shall have become general and extended to all countries and to all breeds, animals entered on the ground of their ancestry, whether in the case of open or of closed Herdbooks, and intended for export, must be presented to a competent authority to be appointed by each Country. This authority shall be responsible for deciding whether these animals correspond to the type, characteristics and qualities of the breed.

For the Herdbooks for which inspection is already practised, the fact that an animal has been approved after inspection is sufficient.

Article 6.

The animals to be entered on the Register of births shall be marked by such means as will ensure easy and certain identification (*e.g.*, tatooing, ear-punching, nose or lip-prints, horn branding or any other new method recognized to be effective for the purpose).

The above enumeration of methods of marking animals is in no way an exclusive one. Any effective means may be adopted.

All other indications serving to identify the animal must be supplied in addition (*e.g.*, a skecth of the outline of the markings in the case of spotted breeds).

Article 7.

The Herdbook authorities may issue certificates or extracts from the individual sheets for each animal entered in the Herdbook. The individual certificates, so as to be easily comparable, shall contain the information as indicated on the specimen sheet, attached to the present Convention.

Article 8.

Each certificate shall indicate the Register (*a*), (*b*), or (*c*), from which it has been taken.

Article 9.

The certificates accompanying the animal must contain all particulars shown on that animal's individual sheet relating to the pedigree [ancestry and offspring in Registers (*b*) and (*c*)], to the yields and in general to all information required by the present Convention and shown in detail on the specimen sheet attached.

Article 10.

The data shown by the certificate must be certified as correct by the authority in charge of the Herdbooks. The same holds true for all information relating to subsequent yield records which shall be entered later.

Article 11.

The recording of yields shall be organized by the Herdbook Association or by other special institutions working in full agreement with these associations, in accordance with principles and methods which shall be as uniform as possible. The yield recording shall be effected by competent and independent officers under the authority and guarantee of the Herdbooks Association, responsible for entering the records on the individual sheets. In each case, for the animals submitted to yield recording, the information given on the individual sheets shall indicate, in addition to the milk production and the fat content of the milk, the intervals between the recorder's visits, the duration of the recording beginning from the sixth day after calving, the number of previous calvings and the date of the calving following the last recording period.

Article 12.

The Signatory States agree to recognize as registered breeding cattle only those recorded in the Herdbooks which conform to the rules laid down in this Convention. The Signatory States guarantee the proper keeping of the Herdbooks and the systematic working of the organizations responsible for keeping the Herdbooks and for issuing the certificates.

Article 13.

The Signatory States also undertake to notify the International Institute of Agriculture as to the bodies specially qualified officially to endorse, for use in international commerce, any certificate issued by a Herdbook organisation.

Article 14.

A maximum period of three years is granted to the Governments so that the Institutions in charge of the Herdbooks may comply with the provisions of the present Convention.

This period shall be reckoned, for each Signatory State, from the date of deposit of the deed of ratification, and, for the States subsequently adhering to the Convention, from the date of their adherence.

Article 15.

In case of difference of opinion as to the interpretation of the clauses of the present Convention, or in case of practical difficulties in the application thereof, the States interested in the dispute may, in agreement with each other, request the International Institute of Agricluture to try to find a way of conciliation.

For this purpose, a Technical Committee composed of three experts, each of the two States interested appointing its own expert and the International Institute of Agriculture selecting the third, shall investigate the matter in dispute. This committee shall present its report and the International Institute of Agriculture shall notify each of the countries concerned, freedom of subsequent action being left to the Governments. The Governments concerned agree to bear in common the expenses connected with the investigation entrusted to the experts.

Article 16.

All notifications arising out of the present Convention shall be addressed by the adhering Governments to the Government which is the depository of the Convention and to the International Institute of Agriculture, and both these bodies shall inform the Signatory States.

Article 18.

The present Convention shall be ratified as soon as possible by the contracting Countries and the ratifications shall be deposited with the Italian Government.

Notice of each ratification shall be given by the Italian Government to the contracting Countries as well as to the International Institute of Agriculture.

Article 18.

Each contracting Country shall have power to declare, at the time of the deposit of its ratification, that the coming into force of the present

Convention is subordinated, so far as the said Country is concerned, to the giving effect to the Convention on the part of certain other Countries indicated by name.

The present Convention shall come into force as soon as it shall have been ratified by at least five sovereign contracting Countries, unconditionally or under conditions which have been fulfilled.

In this case the coming into force shall begin six months after the date of the deposit of the fifth ratification.

For all other contracting Countries the Convention shall come into force, in each case, within six months after the deposit of their ratification.

Article 19.

The Countries which are not contracting parties to the present Convention shall be admitted to adhere thereto upon their request.

The adherence shall be notified through diplomatic channels to the Italian Government and by the latter to the contracting Countries, as also to the International Institute of Agriculture.

In the text of the present Convention the words *Signatory Countries* indicate the whole of the contracting Countries and of the later adhering Countries.

Article 20.

Any Signatory Country may, at any time, notify the Italian Government that the present Convention is applicable to all or to a part of its Colonies, Protectorates, Mandated Territoreis, Territories under its sovereignty or its authority, or all Territories under its suzerainty. The Convention shall apply to all the territories indicated in the notification. Failing this notification the Convention shall not apply to these territories.

The Italian Government shall inform all other Signatory Countries and the International Institute of Agriculture of this notification.

Article 21.

Any Signatory Country desiring to denounce the present Convention, whether for the whole of its territories, or for the whole or a part of its Colonies, Protectorates, Processions or Territories as under Article 20, shall so notify the Italian Government, which shall inform immediately the other adhering States and the International Institute of Agriculture, indicating the date on which such declaration of withdrawal from the Convention has been received.

Such declaration shall take effect only in respect of the Country which has so notified the Italian Government, or of the Colonies, Protectorates, Possessions or Territories indicated in the act of declaration, and that not until one year after the notification shall have been received by the Italian Government.

Protocol of signature.

At the moment of signing the present Convention, the undersigned Plenipotentiaries make the following declarations :—

(A) While considering that an international organisation of Stud, Flock and Herdbooks for horses sheep and pigs would be

desirable but recognizing that for these three classes of livestock there are special questions and problems which are not yet adequately defined, the undersigned resolve to limit for the time being the application of the present Convention to cattle, leaving the adhering Governments free to propose at a later date, if found advisable, to extend to other classes of livestock regulations on lines similar to those proposed for cattle.

(B) They invite furthermore the International Institute of Agriculture to organise in the near future a meeting of experts responsible for the keeping of the Herdbooks of the Signatory Countries of the present Convention, in order to make clear the details of the application of the measures laid down by the Convention, including the standardization of methods and procedures of yield recording, and to present to the International Institute of Agriculture draft recommendations to be proposed to the Governments.

(C) The Signatory Governments request the International Institute of Agriculture to proceed, at the expiration of the 5th year following the singnature of the present Convention, to make an inquiry among the Governments bound by the Convention, as to the advisability of convening a meeting of Experts nominated by themselves, with a view to submitting proposals to the Governments concerned, for the introduction into the Convention of such amendments as may have in practice appeared necessary, or for the supplimenting of its provisions.

(D) It is desirable that, in each State, a special body be made responsible for laying down the general principles to be followed in the keeping of Herdbooks, and for the supervision of the regular operating of these books in accordance with the principles laid down by the present Convention.

It is desirable that on this body, in addition to the Ministries concerned, breeders and animal husbandry experts be also represented.

The States which have instituted such an organization shall inform the International Institute of Agriculture, so that the latter may advise the Countries adhering to the Convention.

(E) The wording of the certificate appended hereto contains only a minimum of the information required. States shall have power to add such indications are considered advisable. As regards the form of the certificates, the appended model form is not compulsory, but it is desirable that it should be followed.

Reservations.

United States of America has signed the Convention with a reservation that, although agreeing in principle to the provisions of Article 12 of the present Convention, reserves the right to exercise its discretion with reference to their enforcement.

Denmark has signed with a reservation as regards the Register of Births (Article 2-a).

HERDBOOK CERTIFICATE—EXTRACT FROM THE REGISTER.

(*A, B C*)

Issued on.....19.....

Issued by .....Locality.....Country.....
(adhering to the International Herdbook Convention).

Name of animal..... Sex .....Date of birth.....

Breed ..... Herdbook No.....Date of Entry.....

Breeder ..... Owner.....Marks of indefication....

Prices and Awards.....

Ancestry		Offspring as indicated on reverse side			
Sire	Dam	Sons	Daughters	Grandsons	Grand Daughters
.....	.....	....	.....	.....	.....
Grandsire Granddam	Grandsire Granddam	....	.....	.....	.....
		....	.....	.....	.....
.....	.....	....	.....	.....	.....

Signature and stamp of the office authorized to confirm the correctness of the certificate.

.....

Signature of the Herdbook Officer in charge.

.....

Yield of animal entered under the No.....

Calving		Actual length of recording, in days (*)	Recorded yields			Signature of the Herdbook officer in charge.
No.	Date		Milk lb.	Fat lb.	Fat percentage	
1						
2						
3						
4						
5						
6						
..						
..						
..						

(*) From the 6th day after calving.

Intervals between recorder's visits.....days.

(On the back of the Herdbook

Yield of females of the ancestry.

Degree of relationship.	Herdbook No.	Calving		Actual length of recording in days (*)	Recorded yields			Signature of the Herdbook officer incharge.
		No.	Date.		Milk lb.	Fat lb.	Fat percentage.	
		1 2 3						
		1 2 3						
		1 2 3						
		1 2 3						
		1 2 3						

(*) From the 6th day

Intervals between

Certificate.)

Yields of the daughters of the sire for which information has been requested by the owner:

Herdbook No.	Calving		Actual length of recording in days (*)	Recorded yields.			Signature of the Herdbook officer incharge
	No.	Date		Milk lb.	Fat lb.	Fat percentage	
	1 2 3						
	1 2 3						
	1 2 3						
	1 2 3						
	1 2 3						

after calving.

recorder's visits.....days

SUPPLEMENTARY NOTE ON ITEM No. 8 OF THE AGENDA

by

MR. MAQSUD ULLAH S. JUNG,

Deputy, Director, Incharge Cattle Breeding, Jhansi.

Government has proposed to open one Cattle Breeding Farm in the Eastern Part of the United Provinces. This farm will stock Sahiwal padigree cows, where milk records, etc., will be properly maintained.

Recently under the supervision of the Department of Agriculture, pedigreed Sahiwal herds are being kept at certain selected Jails in the United Provinces, where proper milk records, feed records, etc., will be kept. There are three Government Agricultural Institutions *viz.*, Cawnpore Agricultural College, and Gorakhpur and Bulandshahr Agricultural Schools where also pedigreed farm bred animals are kept.

The Imperial Council of Agricultural Research has recently appointed in the United Provinces a Milk Recorder who will look after the records of Jails and other Government Institutions.

In the United Provinces as yet no formal pedigree registration work has started the reason being the lack of any typical dairy breed in this Province.

NOTE ON SUBJECT No. 9.

THE ORGANISATION OF THE SUPPLY OF BREEDING BULLS WITH SPECIAL REFERENCE TO HIS EXCELLENCY THE VICEROY'S GIFT BULL SCHEME.

by

E. J. BRUEN, I.A.S.

Livestock Expert to the Govt. of Bombay.

The Cattle in India may be roughly divided into 3 major groups :—

(1) Milch Cattle (*i.e.*) the cows of which can be profitably used as Dairy animals.

(2) The dual purpose animal, a medoicre milch animal, the bullocks of which are fair draught cattle.

(3) Purely draught types or breeds.

Having thus classified our cattle it will be seen that the production and supply of pedigree bulls to meet the above must necessarily differ. Taking each type individually, we shall start with the Milch type. Here our main object is milk. To produce a stud bull in this class, we must necessarily resort to the recording of milk of the cows. To do this we must have either Government or private farms whereat all the necessary pedigrees and milk records are maintained. Such Dairies are usually commercial concerns which keep only those cattle that give them a return or are expected to give a return in the near future. Bulls being of little value to such are disposed at of an early an age as possible as it does not pay to rear these to maturity. The reason for this is that the Indian breeder will not pay for pedigree. It has been my experience that it costs anything from Rs. 350 to 450 to raise a pedigree Milch type bull to maturity. Now how many people are there in this country who would pay this price for a bull although it may be worth a good deal more than its cost to rear. Now if the Provinces and States wish to improve their cattle especially the milking types, we must encourage those dairy farmers who have pure bred cattle to rear their bulls. This encouragement may be given in many forms—(*a*) A guarantee by the local Government or State to purchase all worth while bulls at a fixed agreed price, (*b*) By giving concession in land or water where available.

Then to get breeders to accept or take such bulls we must offer some help. This is essential as the villager usually only has one or two cows of his own and he cannot afford to maintain a stud bull which is costly to keep. Service fees unless very high will not pay for the keep of a bull, so the State must again come forward and help either towards the purchase price of the bull or towards its upkeep.

2. In the case of the dual purpose animal, we need not be so particular about milk yields. This type of bull can be bred and raised in the village under some form of supervision at intervals. Being raised in a village it is not so costly to bring to maturity. But even here some form of encouragement both to the breeder and to the person who takes a bull is essential although it may not be as liberal as in the case of the milch breeds. In this case hard registration is essential to enable us make sure we are getting a pure bred bull

and to watch its progeny to judge progress. In the case of purely draught types the problem is easier as less supervision is required. Here we need Registration and less supervision. The breeders of draught cattle have by necessity to rear their male stock as this is the only income they get from their cows. Encouragement to breed good stock is necessary but in a cheaper form. The placing out of known pedigree bulls on a Premium System either by paying a monthly maintenance or a subsidy towards purchase is all that is necessary, with a promise to purchase or have purchased those of their male stock conforming to the standard required.

3. To summarise the 3 types suggested above :—In the case of milch stock we must have reliable Dairy farms from which we can get pedigree bulls. In the case of the dual and draught types these can be produced in villages. The idea suggested is to select a group or groups of villages possessing even fairly pure stock, taken by the outward standard of the breeds concerned. After selecting your group of villages all the female stock coming up to standard or earmarked and registered. Then you proceed to castrate all undesirable males and place in those villages a sufficient number of the best bulls available. The first generation will be an improvement and by the second or third generation you have a large number of pure bred bulls all pedigree ready for any extension either in producing more pedigree stock or for introdution into other villages for grading up. In the case of the dual purpose annual periodical testing of cows for milk yield must be taken to improve the milking side of the dual purpose animal.

4. The Viceroy's Gift Bull Scheme has been the means of awakening an interest in cattle improvement. The scheme as adopted has however many weaknesses. A donor of a bull has been allowed to select his own village for placing his gift bull, he selects a village which shows no interest in cattle and the people are not accustomed to keeping a bull at stud, consequently bulls so placed have failed. In other cases bulls have been donated without upkeep or maintenance charges, such bulls have done fairly well when ample grazing is available but later have been starved and become useless. We have had innumerable reports such as the bull won't serve, or the bull will not eat the grass of the locality and so on. These are generally mere excuses to get rid of an unwanted expensive appendage. The scheme would have been of immense help had the selection of villages in which donated bulls were to be placed were left to the Livestock Department. It is a very strange coincidence that very few bulls have been donated in those areas in which cattle improvement is going on and where the value of a good bull is appreciated and where the people know how to care for a bull. The few bulls that have been placed in such areas and where the location has been left to the Livestock Department, they have done an immense amount of good.

5. It is a well known fact that some villages or Tahsils or Talukas are more suitable for cattle breeding and where the people are keen. We must first select such for our improvement or pedigree work if we wish to succeed. The little success we have had in the Bombay Province in cattle improvement has been due to the fact that we have proceeded slowly making sure of our ground. We now have many groups consisting of about 90 villages in a group in which to-day will be seen only pure breed stock all numbered and registered.

SUPPLEMENTARY NOTE ON UBJECT No. 9.

PROPOSALS FOR THE EXTENSION O CATTLE BREEDING OPERATIONS IN THE UNITED PROVINCES.

by

MR. C. H. PARR, B.Sc.,

Deputy Director of Agriculture, Incharge Cattle Breeding Operations, Jhansi.

Improved herds of the following indigenous breeds are being built up at the farms noted against each :—

Breed.	Farm
Hissar (Hariana) ..	.. Madhurikund Farm, Muttra.
	Bharari Farm, Jhansi.
Murrah Buffalo ..	.. Madhurikund Farm, Muttra.
	Bharari Farm, Jhansi.
Sahiwal ..	.. Manjhra Farm, Kheri, Lakhimpur.
Ponwar, Khairigarh	.. Hempur Farm, Kashipur, Nainital.

In the above herds improvement is being created, and by means of the Bull distribution scheme, bulls produced from these herds are distributed to villages for improving the local cattle. Of the above, Hissars are being bred on general utility lines, keeping in mind the requirements of draft conformation as well as milk. The basis of the breeding of the Sahiwal and Murrah Buffalo breeds is milk capacity and constitution. The Ponwar and Kherigarh breeds are purely draft breeds and draft considerations only are taken into account in their selection.

The object of these herds is (*i*) to establish pedigree by carefully controlled breeding methods (*ii*) to produce a supply of bulls for distribution under the Bull distribution scheme for stud purposes in villages, so that the improvement produced by intensive breeding methods in these pedigree herds can be transmitted to village herds for their gradual improvement.

As the demand for bulls is in excess of the number which can be raised at the above Government Stud Farms, purchases of suitable Hissar bulls, Murrah buffaloes are made in the Punjab, and Kherigarh and Ponwar bulls from professional breeders in certain Terai areas near Pilibhit. As the bulls bred on the stud farms are all pedigreed and more valuable as breeding animals, they are all concentrated in certain districts, Hissar and Murrah buffaloes in Muttra, Agra, Etawah, Mainpuri and Cawnpore : the Kherigarh in Kheri district. By the development of a scheme of registration of cows, and their progeny, and by more careful control of breeding it is hoped that it will be possible to develop these intensive breeding areas for the supply of bulls suitable for distribution as stud animals to other areas. All areas outside the intensive breeding areas are supplied with selected bulls which have been purchased from whatever sources suitable animals can be obtained.

To develop the work more rapidly on these accepted lines the following are the immediate requirements.

1. Stud bulls.—

Every large village requires a carefully selected bull and a bull buffalo. At present in the majority of villages any type of bull is allowed to breed. This leads to inevitable deterioration of type. Ample facilities for castration are required to ensure that all animals of inferior type are castrated and only selected animals of superior type are allowed to breed and propagate their kind. Such bulls are seldom available in villages. They must be provided through Government agencies. The bull distribution scheme as organised by this department, provides the means whereby bulls can be supplied at very little cost to Government. Experience has shown, that with very little organisation, the village breeder can be easily induced to contribute a share to the cost of this scheme. Under the scheme now working the village breeder is already making a large contribution. All bulls are issued at a young age $1\frac{1}{2}$ to 2 years. They are all reared in the village for about a year before they become old enough for stud purposes. They are maintained subsequently at the cost of the village. They are not subsidies, or maintenance expenses. Furthermore the persons indenting for the bull contibute Rs. 22 per bull towards its initial cost. The bulls however, remain the property of Government, the contribution of Rs. 22 per bull is made merely for its stud service. When the service life of a bull is finished the price it fetches is credited to Government.

By virtue of the contribution of Rs. 22 per bull, the receipts on account of sales of time expired bulls, and because the bulls are reared and maintained entirely at village expense, the final cost to Government of the supply of high grade purchased bulls under this scheme is only about Rs. 25 per bull.

Careful enquires in the villages where such bulls have been located have shown that the benefit of these bulls to villages is very large and varies from Rs. 500 to Rs. 800 per year. If the service life of a bull is 10 years the extra benefit to the village is from Rs. 5,000 to Rs. 8,000. This beneficient return has secured at a cost in the case of purchased bulls of only Rs. 25. It is doubtful if there are many beneficient scheme of Government which give such a large return at so small a cost.

There is no doubt, that where the benefits of the bull distribution scheme have been very widely demonstrated, it is only a matter of proper organisation and village breeders will be found willing to bear even a larger share of the cost of such bulls. If work is pushed forward on the lines suggested below I can confidently predict that the village breeder will be willing not only to bear a larger share of the cost of all stud bulls, but will contribute to (*i*) the cost of Veterinary service to protect him against loss from disease, (*ii*) for the purchase of Burdizzo castrators to enable him to carry out castration operations in a more humanitarian manner, and (*iii*) for technical advice in Cattle Breeding and Animal Management.

PROVINCIAL ORGANIZATION FOR THE DEVELOPMET OF THE CATTLE BREEDING INDUSTRY.

Village organisation.—

Village cattle are managed largely on a community basis. The village therefore must be taken as the basis for the work. There may be one or more

herds in a village. These herds may be distinct and have their own grazing grounds but as far as village stud animals are concerned, whenever any special provision for these is made as by gift or dedication custom had decreed that the services of stud animal are available to all. The stud bull is a public institution towards the cost of maintenance of which, the village breeders are accustomed and willing to contribute. This co-operative attitude towards stud animals can be further encouraged and it is believed, can be directed to secure results which will change the present trend of live stock degeneration to one of live stock improvement.

The development of the following organisation, which is based on this underlying principle, will enable this inherent willingness of the village cattle breeders to contribute further to the cost of live stock improvement to be fully explioted. To secure the permanent co-operation of the villages in stock stock improvement, our organisation must be based on a permanent representative resident in the village who will act as the mouth piece and village supervising agency for the cattle breeding department. In the village patwari we have an official usually a resident of the village, with very intimate knowledge of village conditions. He is the basis of the Government's Rerevenue System. It is suggested that he should be made the basis of Government organisation designed to increase the villager's capacity to earn and improve his lot.

In regard to live stock improvement, the patwari working in co-operation with the village panchayat or village authorities is in a position to organise village funds which can be set aside for the provision of suitable stud bull when they are required under the terms of the present Stud Bull Distribution Scheme. On the basis of a subscription of four annas per cow per year sufficient funds would be provided in one year for a stud bull. If this subscription is made an annual one, a buffalo bull could also be provided and in subsequent years provision for maintenance of the stud bulls, veterinary comforts Burdizzo castrator and other such purposes. If, say, twenty villages co-operated and alloted a sum to a group fund, provision could be made for effective veterinary service and technical advice on breeding and animal management problems. The same principle applied to other animals, say sheep and goats, on a basis of a much smaller contribution would make provision, for the supply of suitable stud animals of these species, and for local expert advice in regard to their maintenance and management.

Experience gained in operating the stud bull distribution scheme under which over 500 bulls have been supplied to villages has shown that if a suitable permanent organisation is provided, which will ensure that the villager will secure a regard for co-operation, the villager on his part will be anxious to take advantage and co-operate in live stock improvement schemes. There are few subjects which make greater appeal to the cultivator than the wellfare of cattle. At heart he is a cattle fancier, and is cattleproud, and provided the schemes which are put forward, are to his mind parcticable, and within the limits of his means economically they will meet with his ready response.

The supervision and the organisation of the village funds must devolve on the the Collector or Deputy Commissioner and his Assistants and Revenue

Staff. It will be the duty of the Agricultural Department to supply the stud animals and that of the Revenue Department (*i*) to organise the funds (*ii*) to locate the bulls (*iii*) to assist the Agricultural Department in inspecting them and (*iv*) to keep that Department fully informed regarding them. In specially selected areas the Revenue staff will be in a position to give the Agricultural Department assistance in recording, and registering the breeding of animals in villages with a view to the adoption of special breeding methods for establishing pedigree.

Work on these lines has been in progress in the Muttra District and the Collector has organised village funds for the supply of over 200 Hissar bulls to the District Cattle Improvemnt Committee under the Provincial Bull Distribution Scheme.

It is proposed to organise in each district a District Cattle Improvement Committee. The District Officer will be the Chairman and other district officials of the Department connected with the work will be members. The Committee will include representatives from the village Cattle Improvement Committee and will be constituted to give as wide a representation to the cattle and live stock interests of the district as possible, to enable the committee to advise Government in regard to live stock schemes, to assist in their supervision and to do everything in their power to promote the development of the live stock industries.

From the District Cattle Breeding Committees of the Province it is proposed to constitute a Provincial Cattle Breeding Board, composed of officials and influential and well-informed practical men capable of representing cattle breeding and other live stock interest throughout the province.

Such an organisation will ensure active and financial co-operation of all zamindars and Agricultural leaders interested in the development of these industries throughout the province and can not fail to give practical effected to the expressed wishes of His Excellency the Viceroy in this connection.

Live stock shows.—

Tahsil and district live stock shows should be organised in every district. They should be made permanent events. The District Cattle Breeding Committees should be made largely responsible for their organisation. At least Rs. 1,000 per year should be provided annually as prizes. Live stock showoffer an admirable opportunity to leading zamindars to encourage to development of the live stock industries by undertaking to give a prize every year under their own name for some particular class of animals. There is, therefore, considerable scope for securing the active co-operation of influential people through the medium of live stock shows and of creating a healthy cooperative spirit between villagers and breeders. Such shows could be started immediately, with great advantage in those districts where there are 100 or more Government stud bulls.

NOTE ON SUBJECT No. 10.

THE FORMATION OF BREED SOCIETIES AND OTHER LINES TO BE ADOPTED FOR THE IMPROVEMENT OF MILCH CATTLE AND BUFFALOES

by

WYNNE SAYER,

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We have now reached a stage where it is necessary to consider what steps are to be taken in the future to bring cattle breeding into line with other subjects, as far as its actual policy is concerned. We are told that cattle breeding is mainly the business of the local governments, but it is an open question how far this pronouncement can be accepted in the case of milch breeds of all-India importance. I am personally convinced that the more famous breeds will no longer be peculiar to provinces in India any more than are to counties in England, and for that reason an all-India organisation is imperative, if we are to make proper progress along correct lines in dealing with milch problems. At present Government represents the focus of activity in all cattle breeding operations, and it is a very moot question as to how far the best interests of cattle breeding will progress in the future under such tutelage. Its value as a foundation in the past and its utility as a stimulus in the present is freely admitted, but there is a distinct feeling abroad that breeders should now try to organise themselves as far as possible so as to be able to have a definite voice in cattle breeding matters, both by virtue of their knowledge as well as their interest.

The Scheme of Control to work up to is one of breed societies, local and central shows and a general organisation of the country to this end. There is no need to teach the ryot cattle lore. He is as proud of a good animal as anyone, but he has to be organised to realise that all good animals are not solely the property of Government and that he, as the breeder, is after all the ultimate director of cattle breeding in all breeds. In England the King competes on level terms at all cattle shows with the tenant farmer, and it is the animal alone which is judged, and it is the breed societies, who care nothing for rank or title, which have brought this about. They are the real controllers of old cattle policy, and their judgement is doubly sound, because their knowledge is linked to their interests in all matters connected with cattle.

It is most noticeable that in all countries where cattle are most highly bred, Breed Societies exist and flourish. The services rendered by these Breed Societies are well known to all who are interested in the improvement of milch cattle. These societies are managed by actual cattle breeders, and they are therefore better able to guide and advise in the improvement of milch cattle than people who are not so intimately connected with the actual breeds, as it puts the control of the breed, type, points, characteristics, etc., entirely in the hands of the actual breeders. Officers in charge of Government herds and Government animal husbandry experts are not to the same degree personally interested

in the subject of cattle improvement as is the actual owner of a herd. Government can remove or transfer the man in charge, and it may and can frequently happen that for administrative reasons, quite unconnected with cattle breeding work, it is necessary to place a man, who has no real knowledge of the subject, in charge of Government herds and cattle policy. The harm this sort of thing can do is incalculable, and this has been clearly realised and guarded against in England, U. S. A. and all other prominent cattle breeding countries.

It is, therefore, most desirable that in India similar Breed Societies should be started for the improvement of the eight important milch breeds of the country. The objects of these societies would broadly be as follows :—

(i) To maintain the purity and improve milch breeds in India, and generally to promote the interest of breeders of milch cattle.

(ii) To compile and publish Herd Books of such cattle.

(iii) To collect, verify and publish information relating to Milch cattle, to examine such animals as may be submitted for inspection and investigate their pedigrees and to register the pedigrees of such cattle as are proved to the satisfaction of the Council of the Society to be eligible for entry in the Herd Books.

(iv) To hold Shows or sales of cattle and to offer prizes at such Shows or at the All-India Cattle Show or at Shows of any other Society.

(v) To promote and disseminate information with reference to the breeding and management of cattle.

The introduction of Breed Societies will afford Government a valuable avenue of approach to the real cattle breeders and a means of ventilating cattle questions. It will also give the breeders a definite means of approaching Government as a responsible body in such matters as export rights, etc. At present both are really unknown to each other, and this is most undesirable.

Real progress and real interest can only be expected when the breeders govern the breed. Cattle should never be politics, and every effort should be made to keep them out of the arena as far as possible.

Herd Book.

It is customary in all modern cattle breeding countries to have a Herd Book for each breed. The Breed Societies would register the pedigrees of all animals in their respective Herd Books on the basis of the description, characteristic and type as defined in the respective conveners' reports of the Imperial Council of Agricultural Research (Definition of characteristics of seven breeds of cattle of All-India importance).

Register of Dairy Cattle.

This will be an official yearly publication for milk-recorded cows and pedigree bulls with the following objects :—

(i) To provide outside buyers, dairy farmers, and pedigree breeders with lists of high yielding milk recorded cows which have been regular breeders and with lists of dairy bulls.

(ii) To provide a book of reference for persons wishing to obtain dairy cattle with good milking records or the progency of such animals.

(iii) To encourage the keeping of authenticated milk records, and the breeding of high-class dairy cattle.

(iv) To encourage dairy farmers to use pedigree bulls from a milking strain.

The Register will be divided into two Sections, *viz.* :—

Section I.—Dairy cows of any breed or type in respect of which Certificates of Merit have been awarded.

Section II.—Pedigree bulls for Dairy Herds whose four daughters, each from a different dam, have given the standard yield prescribed for their breed.

Certificate of Merit.—A cow must have given during a period of three consecutive Milk Recording years not less than the prescribed yield of milk and must normally have calved not less than three times during those years.

Standards.—The standard annual yields prescribed for the various breeds are as follows :—

	lb.
1. Gir	6,000
2. Hariana	6,000
3. Kankrej	6,000
4. Ongole	5,000
5. Sahiwal	8,000
6. Sindhi	7,000
7. Tharparkar	7,000
8. Murrah (Buffaloes)	6,000

We have to make a start from small beginings, but we have a full organisation in many other countries from which we can learn. The future of our milch breeds lies in proper milk recording, and this can only be obtained under a society. Such recording leads to high prices and good sales for there is an insistent demand for good milch animals throughout India, and this will benefit the breeder whose animals are recorded.

Shows.

The question of shows is of the greatest importance as it is by the healthy influence of competition that breeds improve and breeders obtain an opportunity to see the best stock, exchange ideas and learn where their own stock fail or excel. India is a country of tremendous distances, and it is obvious that nothing is more unsatisfactory than to send unsuitable animals enormous distances to compete at All-India Cattle Shows. It should be realised that the real function of such a show is to select the best from the best and that all preliminary selections should have been made at the provincial shows held previously,

and only the winners sent to compete against all other provinces at the All-India Show. Here breed societies can assist enormously by their shows held in the foundation area of the breed. By such means, a network of exhibitions will be set up which will not only draw attention to good cattle, but also facilitate that intercourse between buyers and sellers which is the life-blood of cattle breeding.

Two things are very urgently required (1) that Government shall be in close touch with the actual cattle breeders for discussion of cattle questions, (2) that the buyer (often from abroad) shall be able to deal with the actual breeder who will then get his full monetary reward for his skill instead of seeing it go to the middleman or broker as is now all too often the case. When these are established, cattle breeding in India will be on a safe and sure line towards improvement and a position worthy of its importance in this country.

NOTE ON SUBJECT No. 11.

THE PRESENT POSITION IN INDIA WITH REGARD TO THE SALVAGE OF DRY CITY COWS AND SUPPLY OF MILK TO LARGE CITIES

By

Zal R. Kothavalla, B.Ag., Ani. Hus. (Bom.), B.Sc. Agri. (Edin.), N.D.D. (Scot.), Imperial Dairy Expert, Bangalore.

The subject of salvage of dry cattle from city milch cattle stables has always been before the minds of the people who look at the problem either from the humanitarian point of view, or from the point of view of preserving and developing the indigenous breeds of cattle. Of recent years, the subject first found its place on the agenda of the Second Meeting of the Animal Husbandry Wing of the Broad of Agriculture and Animal Husbandry held at Madras in December, 1936. It was resolved at that meeting that as the position with regard to this problem was different in each province, a small committee of experts should be appointed to study the problem very thoroughly and make concrete recommendations. Accordingly a committee of six members was appointed. The first meeting of this committee took place on 26th January, 1937, when some more members were also co-opted. The committee after discussing the problem made a number of recommendations which were to be communicated to the Provincial Governments and States for their guidance although at the time of appointing the small committee the idea was that this committee should visit important centres and after studying the conditions on the spot and collecting information on the subject make concrete proposals for solving this problem.

2. In order to ascertain the extent to which these recommendations were acted upon by the various Provinces and States, the departments concerned were addressed on the matter and up to the time of writing this note, out of 12 inquiries made, replies have been received from 10. The information received indicates that in most of the important cities like Bombay and Calcutta where this problem is most acute, practically very little or nothing has been done *officially* to solve this problem. Madras City appears to be the only place where active steps are being taken by the Veterinary Department to salvage dry cattle from the city stables. These efforts are mainly directed towards providing concessions in railway freight for transporting dry animals back to places where grazing is available (mostly to forest areas and not necessarily to breeding tracts) reserved for the purpose by Government. This experiment is still in its infancy and although the immediate effects of these measures is to cause an increase in the number of dry cows (from 664 in 1937, to 2,287 in 1938) being re-exported from Madras City to grazing areas, it is problematic if this will eventually provide the proper solution. My long experience in this direction has shown that this method has the following disadvantages :—

(*a*) A very high percentage (ranging up to 75 per cent.) of such salvaged animals is rendered useless for further breeding owing to the malpractices—such as 'phooka', 'ghami', etc., to which these animals are subjected in city stables.

(*b*) Even if the salvaged dry animal is capable of breeding, as it is not covered in time it takes a very long time for it to come into calf. Even after calving it truns out a poor milker in the majority

of cases due to the deterioration in its constitution as a result of being kept under unnatural conditions when taken to city stables for a long time.

(*c*) The cost of transporting these both ways and their maintenance during the dry period (which invariably is very long) amounts to a figure which would enable the gowala to buy a new and better animal form the breeding tracts. Thus it is an uneconomic proposition.

(*d*) These animals are not wanted back by breeders in the breeding areas, as they swell the number of unprofitable animals and tax the fodder resources and also bring about the deterioration of the breed.

Replies from some of the provincial officers and states on the other hand show that the problem of salvaging dry animals does not arise with them, as due to the favourable situation of the urban areas these areas derive their milk supply either from the surrounding rural areas or from cows maintained in towns for the purpose. These animals are easily returned to the surrounding breeding areas when they go dry. In one or two instances efforts were being made at establishing ' Gokulams ', *i.e.*, suitable centres for accommodating gowalas and their cows in the vicinity of cities, so that the producers may not be tempted to keep the animals under unnatural conditions in cities, and thus causing the economic deterioration of the animal. Looking to the urgency of the problem efforts such as are described above do not touch even the fringe of the problem. In the meantime the conditions with regard to the slaughter of prime animals and the supply of milk to urban population continue to be what they were some 25 years back. These conditions were dealt with in great details and various suggestions made for their solution in the note prepared by me for the meeting of the Dry Cattle Salvage Committee held in January, 1937, and I herewith reproduce this note (See enclosure No. 1) for the benefit of the members of the Board, more especially as this note could not receive full consideration at that meeting due to shortness of time.

3. All are agreed on one point and that is that the slaughter of prime animals from the city stables and the consequent necessity of salvaging them arise out of the existing faulty system of milk supply to our cities— a system which appears to be as primitive as it is uneconomical compared to the methods that are being followed in other civilised cities of the world today. The proper solution to this problem therefore lies in the replacement of the present system of milk supply to Indian cities by a more up-to-date, economic and suitable one. This in other words means the gradual replacement of the milk produced in the existing city milch cattle stables by milk produced in areas away from cities and towns where the animals could be fed, housed and bred under natural conditions, and then of transporting this milk under hygienic conditions to urban areas. How this could be achieved forms a problem of the first magnitude which should be stutied on the spot. Every important city calls for a solution suitable to its own requirements. My long experience has shown that any legislative enactment by itself to prevent the slaughter of dry animals or to force the milch cattle stables out of urban areas would be of little avail. A more effective way would be to bring economic pressure to bear upon the city gowalas to force them into removing their cattle gradually from the urban

areas on the one hand and on the other to offer them inducement to settle down into suitable places specially selected for the purpose and under the guidance of proper authorities. Such conditions would then be conducive to the production of cheap milk. The note submitted herewith (see enclosure No. 1) offers practical suggestions on the point. Some efforts were made in the past in this direction in some of the provinces, both by the Government and local bodies, but as they were half-hearted and not properly co-ordinated they were not successful. Efforts were also made in various provinces by enterprising public men to establish institutions in rural areas for producing and collecting milk under cheap and hygienic conditions and transporting the same to large cities. Their experience, however, has so far been far from encouraging due mostly to want of protection by the local municipalities against fraudulent dealers. The uneconomic conditions of producing milk under city conditions compels the city gowals to adulterate the milk with water and the want of proper control and supervision by the municipalities enables the gowala to adulterate this milk up to 50 per cent. (cases have been noted up to even 80 per cent.) Thus he is able to undersell the *bona fide* trader and ruin his business. Effective prevention of the adulteration of milk and milk products in large towns and cities—in other words the proper Legislative Control of the Dairy Industry, therefore, forms the crux of the whole matter. Until this is provided for it will be impossible to develop sanitary dairying on modern lines in natural dairy tracts outside big cities nor to arrange for the transport of cheap milk at present produced in abundance in some of the rural areas within reach of large cities. Unless this is brought about, mere salvaging of dry animals would be of little avail and the drain on the cattle resources of the country must continue.

Apart from the effective protection of the *bona fide* traders against fraudulent dealers there are a number of other factors which require immediate attention. They are fully dealt with in the accompanying note (see enclosure No. 1). Any action taken on them will materially help in ameliorating some of the evils associated with the existing system of milk supplies to Indian cities but the eventual solution of the problem must lie in doing everything possible to develop a milk supply to all big cities from areas where milk can be produced economically under natural conditions, the cows being regularly bred from, as long as they can breed and the progeny reared under normal healthy conditions.

4. The present faulty system of milk supply to the cities costs the country as much as over ten lakhs of rupees per annum, in the slaughter of its prime animals—not to speak of the progeny which also gets exterminated. No cost will therefore be too great nor any effort too much, if the continued drain on the cattle wealth of the country is to be put a stop to as soon as possible. The only effective way in my opinion to solve this problem would be to appoint a small but a strong committee which after a thorough inquiry conducted at a few important centres make concrete proposals which could be put into effect by the Provincial Governments and municipal bodies. The activities of this committee should be given as much publicity as possible to arouse public interest and the interest of those in the trade, so that the committee may be able to take into consideration all the aspects of the problem, before drawing its conclusions.

ENCLOSURE No. I.

Note on the salvage of Milch Animals from city stables, by Zal. R. Kothavalla, Esqr., B.Ag., Ani Hus. (Bom.), B.Sc. Agri. (Edin.), N.D.D. (Scot.), Imperial Dairy Expert, Bangalore.

(Note prepared for the Dry Cattle Salvage Committee, January, 1937.)

This problem was intimately studied by me while I was working with the Bombay Municipality from 1921 to 1925. I am therefore submitting the notes prepared for the Municipality, which contain facts and figures obtained under my own personal supervision. These notes are submitted in the form of annexures, as follows :—

Annexure I.—Note on the economic aspect of the question regarding restrictions on the slaughter of milch animals (January 1925).

Annexure II.—City milk supply and the slaughter of milch cattle (1924).

Annexure III.—Note on the Bombay milk supply and its improvement (1922).

Annexure IV.—Present system of city milk supply and its drawbacks (1924).

Annexure V.—Statistics of the milk supply of Bom bay city (1923).

There has been practically little change in the conditions since the notes were written and although they pertain to the city of Bombay, some of the main feature are common to almost all the big cities in India. I am offering further observations in this note on the subject, in the light of experience gained and they are put in the form of suggestions, for the consideration of the committee. Due to shortness of notice the notes had to be drawn up very hurriedly and some of the points could not be dealt with as fully as I would have liked to. Before going into details I would like to observe that in finding a solution to the problem of Salvage of dry cattle from city stables we shall only be cutting the branch of an evil tree instead of striking it at its very roots. Any measures which could be adopted for the above purpose should therefore be looked upon as merely tentative. THE ULTIMATE SOLUTION OF THIS PROBLEM LIES IN SHIFTING THE MILCH CATTLE STABLES FROM THE URBAN AREAS AND REPLACING THE PRESENT METHOD OF MILK SUPPLY TO CITIES BY MILK WHICH WOULD BE PRODUCED UNDER MORE NATURAL CONDITIONS. The removal of the cattle stables from the cities and the consequent prevention of the salughter of prime milch animals CAN BE BROUGHT ABOUT MORE EFFECTIVELY THROUGH ECONOMIC PRESSURE RATHER THAN THROUGH ANY LEGAL ENACTMENTS. This should be associated with some form of inducement for the city cattle owners to

Suggestion (1). Adopt measures to bring pressure to bear on the town gowalas.

move out. Economic pressure might be brought to bear on the city gowalas by the following measures :—

(i) Increase in Municipal tax and stable licence fees.

(ii) Increase in freight in the transport of cattle to cities.

(iii) Increase in slaughter fees of cattle from city stables.

(iv) To provide an incentive for the return of good animals to areas where they can live and thrive under natural conditions the railway freight for dry animals should be effectively reduced.

(v) Introduction of a system of registration of cattle under a scheme such as is suggested in Annexure I.

Suggestion (2). Legal prohibition of sluaghter of milch cattle undesirable.

Any kind of legislation for the controlled slaughter of such animals on the basis of age limits would be like a double edged sword and it is likely to do more harm than good. Especially with the existing religious sentiment it will lead to communal discord.

Suggestion (3). Introduce milk from rural to urban areas through factory system.

The solution of the problem of supply of milk to towns does not lie in merely starting dairy farms. For cheapness of production the existing milk producing areas should be tapped. This involves the factory system of handling milk in bulk. This can best be worked co-operatively. Practical method of collecting, processing, handling and transporting of such milk is still to be determined and that is what is proposed to be done at the Imperial Research Creamery, Anand. Such a source or sources should supply the main bulk of the milk required in cities.

Suggestion (4). Colonisation of dairy farmers or small holders in selected areas for absorbing salvaged cattle.

The dairy farms can form a ring round large cities where the salvaged animals can be absorbed. Government should provide land and other organised facilities in such areas at concession rates to prospective dairy farmers. Merely handing over of such areas in raw condition and shifting cattle stables from the urban areas to this place will be predoomed to failure and will only perpetuate the evils of the existing milch cattle system. The area must be divided into suitable economic units, which should be properly laid out and provided with roads, buildings, water supply, electricity, etc., and let out on hire-purchase system, as is done in Denmark for small holders. This should provide employment for the educated un-employed. Where several of such units are bunched up in a colony a central pasteurising station should be established, if the quantity of milk handled, the distance over which milk has to travel and other conditions warrant. The working of such a colony would be under semi-government control. The best system would be to work it on co-operative basis. Expert techincal guidance from Government would be an essential factor for the success of such a colony. While dairying should be the main objective, the income of the small holders can be supplemented by poultry keeping, vegetable and fruit cultivation, pig keeping, which form necessary

adjuncts to a proper system of dairy-farming and for which products there is always a ready market in large towns.

Suggestion (5). Re-organise and subsidise Pinjrapoles and Gowshalas for absorbing salvaged animals.

Merely salvaging the dry animals from cities and broadcasting them in areas to be reserved for grazing or breeding purposes will not in itself solve the problem. It will only mean accumulation of a large number of useless cattle with which the country is already overburdened. They should be properly bred and handled through the organisation of dairy farm such as are suggested above. Another means of absorption of such cattle would be through the utilisation of the Gowshalas. They existed primarily for the object of providing protection to cows, although laterly they degenerated into asylums for all kinds of derelict animals. The response obtained since the Imperial Dairy Expert started re-ogranising the gowshalas and Pinjrapoles at Delhi, Calcutta, Karachi, Bombay, Cawnpore and other important towns since 1920, has been most encouraging and Bombay in particular provides an example of what could be achieved through the co-operation of such institutions with the local Government. A similarly subsidised scheme could be applied to a few such selected institutions who would help in maintaining the salvaged animals, and it will be one of the cheapest and soundest ways of solving the problem.

Suggestion (6). Return of salvaged animals to cities should be prevented.

One of the factors of prime inportance in this connection, however, is that it should not be the aim in salvaging these animals that they should once again be returned to town stables. Otherwise it will only mean the encouragement of the present uneconomic way of milk supply to towns and the prepetuation of the evils associated with it. The animals salvaged must remain in the areas provided for them and they should eventually become the milk producing sources of the future.

In salvaging the animals from city stables the following facts are to be borne in mind :—

(i) A high percentage of them are rendered useless for further breeding by mal-practices like "phuka" and by fatty degeneration which sets in due to unnatural life in city stables, want of exercise, feeding of highly nitrogenous food, etc. It was once estimated that this class of animals ranged up to about 75 per cent.

(ii) A large number while bearing calves becomes uneconomical due to prolonged dry period after removal from stables, short lactation period and the small quantity of milk they yield. It was ascertained that such animals take from two to three years to revert to their normal life after being taken to breeding areas.

(iii) A fair percentage of them have passed their economic life and would be fit for slaughter-house only.

The measures which could be adopted to counteract such evils would be :— Suggestion (7). Adopt measures to ensure salvaging of profitable animals.

(i) The compulsory maintenance of bulls in every stable and giving service in time.

(ii) Adoption of special legal measures against "phuka" system or any other mal-practice, with heavy penalty, including imprisonment.

(iii) Regulated import and export of milch cattle in urban areas under a system of registration and their controlled slaughter.

(iv) Salvage of young calves before they are tortured and made to die a lingering death. The prospects of preventing the extermination of animals of high milk strains are more promising through the preservation of the calves than through the salvaging of milch animals, as long as the present system of milk supply prevails.

Any restriction on or interference in the export of cattle from the breeding areas to other parts of the country will only add to the difficulties of the cattle breeder who already finds it difficult to eke out an economic living from his business. It will only tend to accelerate the process of extermination of certain important milch breeds which is brought about by the city milch cattle stables. Suggestion (8). No restriction to be put on the export of cattle from breeding areas.

The success of any measure whether it be the salvage of milch animals, or starting of dairy farms or organising the transport of milk from milk producing districts to urban areas, intended for the ultimate solution of the present acute problem of the supply of adequate, cheap, pure and clean milk to large towns, will depend on the extent to which protection is given to *bona fide* trader against the existing gross adulteration of milk and milk products. Legal enactment for the protection of the dairy industry is the crux of the whole thing. This would involve :— Suggestion (9). Adopt measures for the better protection of *bona fide* dairymen.

(i) A suitable Dairy Act for the whole country with suitable standards for various milk products, the conditions of production, etc.

(ii) A complete over-hauling of the present system of supervision and control of milk supply by municipalities.

(iii) Adequate and properly qualified staff for the enforcement of any laws and bye-laws which might be enacted.

(iv) Establishment of well organised agencies for the transport and distribution of milk, which could be easily controlled and supervised in place of the existing method of distribution through hawkers, vendors, etc., which is out of date and most uneconomical.

Unless the numberless streamlets through which the Indian cities draw their milk supply are replaced by a limited number of properly organised and well diverted channels for the flow of milk like what are possessed by other cities of the world, the task of control and supervision of the milk supply of a city by the Municipality will always remain a difficult and doubtful one, with consequent deleterious effect on the dairy trade as a whole.

Suggestion (10). Adopt measures to ensure reasonable price for milk.

During the period of transition from the old to any new system of milk supply and before the latter is thoroughly established, a rise in milk prices is bound to take place and this the consumer should be prepared to face provided he is assured of a better quality milk supply. But this phase can to a certain extent be mitigated and the process hastened by the Municipality adopting measures such as :—

(i) Meeting any increase in the price above what might be considered reasonable or normal if milk were to be brought through an organised system into city areas by providing a subsidy for every pound of milk supplied.

(ii) The findings of the sub-committees of the Milk Legislation Committee appointed by the I. C. A. R. to be taken into consideration and acted upon by the Municipalities even if an all-India Dairy Legislation was not possible.

(iii) Provision of suitable buildings for receiving and distributing milk entering into the city.

(iv) Elimination of the unprofessional milk-men and milk vendors from the trade by encouraging organised efforts at the collection, handling and distribution of milk in cities not amounting to giving a monopoly to certain institutions or bodies. This will considerably facilitate the work of control and supervision by the Municipalities.

(v) Intensive propaganda for the education of both the producer and the consumer.

(vi) Provision of trains with proper timings to suit the suburban milk producers to bring their milk into town.

(vii) Providing specially equipped milk stalls in Municipal markets which could be rented out to approved traders.

(viii) Giving concessions in water-supply, electricity, etc.

(ix) Giving contracts to hospitals and other institutions controlled by the Municipalities to organised traders.

As far as the immediate question of salvage of dry cows from city stables is concerned, the following measures would appear to be effective :— Suggestion (11). Measures for immediate adoption in the salvaging of dry cows.

(i) Increase in train fares for the importation of milch animals into towns to discourage this system and an effective decrease in the return fares to provide an incentive to take the animals to breeding areas when dry.

(ii) Introduction of a system of registration of milch cows brought to towns and the effective control of the slaughter of such animals through such a system.

(iii) Compulsory maintenance of bulls in stables to provide service to milch animals at the right time, to maintain their breeding capabilities. Registration of such services.

(iv) Punishment for " phuka " and other pernicious practice should be legalised and it should be of a drastic nature even up to imprisonment. Similarly any cruelty practised on calves should be punishable by law.

(v) Buying over of the calves from stables and their rearing in rural areas through co-operative breeding societies.

(vi) Appointment of a special officer and adequate staff for salvaging the useful dry animals and their distribution to suitable areas.

(vii) Working out of a scheme for the absorption of such animals in rural areas through the agency of dairy farms to be started on the lines suggested in the note and through the agencies of the gowshalas or Pinjrapoles which should be subsidised for the purpose.

(viii) Providing better accommodation and more convenient train service for the transport of milk to towns from outlying areas.

In the end I would suggest that the only effective method of providing a practical solution to the various complicated problems associated with this question of premature slaughter of prime milch animals, would be to study conditions on the spot. As such the committee as a body should visit three of the principal cities in India, investigate the many drawbacks of the present system of milk supply, collect evidence of all concerned and give as much publicity as possible to this inquiry with a view to arouse the interest of the public at large—the producers, consumers and the capitalists, as also of the municipalities and to enlist their sympathy and support. Suggestion (12). Visit of the committee to three principal cities after giving due publicity.

ZAL R. KOTHAVALLA,

Imperial Dairy Expert.

ANNEXURE I.

BOMBAY MUNICIPALITY.

Note on the economic aspect of the question regarding restrictions on the slaughter of milch animals.

The 20th January, 1925.

(Note by Mr. Zal R. Kothavalla, Dairy Expert, Bombay Municipality.)

" The slaughter of milch animals has a direct bearing on the milk problem of the Bombay City and if it is desired that the citizens of Bombay should get clean, pure and cheap milk, the prevention of slaughter of useful animals brought to Bombay for the prupose of milk production should take some useful and practical shape.

PRESENT SYSTEM.—At present, as a rule, milch animals brought to Bombay, when they run dry, are sold to the butchers by the gowlis. Want of space as well as the high cost of feeding make it prohibitive for the gowlis to maintain them during the dry period. Usually when the milk of an animal falls below six seers a day it is found uneconomical to maintain it. Economic considerations also come in the way of rearing the young or maintaining them with their mothers for any length of time. The young either die premature or are sold for slaughter to the butcher when of sufficient size. Thus along with the good animals their progeny is also lost. The animals that are imported in Bombay for the milk trade are in almost all cases in the very prime of life, as nothing but heavy milkers would prove economical under the present costly system of keeping them in the City. The wanton destruction of useful animals has been going on for years and is on the increase. Figures of the buffaloes slaughtered at the Bandra municipal slaughter house annually show a rise from 8,371 in 1915 to 11,536 in 1922. The same is true of the neighbouring slaughter house at Kurla. The buffaloes slaughtered at the two slaughter-houses are mostly supplied from the City milch-cattle stables.

2. ECONOMIC EFFECTS.—This unrestricted destruction of prime animals brought to Bombay for the purpose of milk production together with the destruction of their progeny which leaves no chance for the good animals being replaced in the breeding areas has led to the draining of the best breeds in the Bombay Presidency, and its effects are even felt in Northern India, whence the Delhi buffalo is imported in fairly large numbers for the Bombay milch-cattle stables. Consequently good animals are becoming and have become scarce, with the result that prices of animals brought to Bombay for milk production have risen about 100 per cent. during the period of the last few years. All this has had a direct economic bearing on the trade of milk and its products in Bombay as explained below :—

(i) MILK.—The dearness of cattle is to a large extent contributory to the increased price of milk sold in Bombay, because :—

(*a*) The initial capital invested in the purchase of the animal is higher.

(*b*) The depreciation in the value of the animals has increased, as the price fetched by the animal when dry has not increased in the same proportion as the increase in the initial cost of the animal.

(*c*) The poor quality of animals now obtainable in spite of the high price, increases the milk production cost due to poor yield of milk.

(ii) BUTTER.—Butter in Bombay is mostly manufactured from cream imported into Bombay from the mofussil. With the growing scarcity of good cattle both outside and in the Presidency, any surplus milk left with the cultivators for being converted into cream for export has disappeared ; the price of cream has, therefore, gone up high and this is reflected in the price of fresh butter sold in Bombay. To keep down this increased price the manufacturers resort to adulterating it with vegetable oils, etc., so that the butter available in the Bombay market is seldom genuine and scarcely wholesome.

(iii) GHEE.—This article of food which is consumed in such large quantities both by the vegetarians and non-vegetarians is also entirely imported in Bombay from the mofussil and it has increased in price due to reasons explained in (ii).

3. Municipal Legislation for the prohibition of the slaughter of cows and buffaloes :—

(a) The Corporation by its Resolution No. 5614, dated the 17th September 1920, and Resolution No. 11840, dated the 3rsd March 1921, prohibited the slaughter of male cattle under three years of age and of cows and buffaloes in calf. The effects of these resolutions were more harmful than helpful to the cause of prevention of slaughter of useful cattle. For by putting a stop to young and weedy animals under four years coming to the Bandra slaughter house from the outlying districts, increased demand for the more useful animals was created. Owing to this measure the very best prime animals which come to Bombay stables are slaughtered. It is characteristic of Indian cattle to mature late. Under natural conditions it is seldom that a buffalo would bear this first calf before three years. Usually it is after the 4th or 5th year that an animal comes in calf for the first time. On an average a buffalo will calve at least 6 to 8 times and till her 7th calving it could be said that she proves an economic milk producer from a dairy man's point of view. That means that up to the age of 12 to 14 years (average life 20 years) she remains a useful animal. What economic loss is incurred every year may be judged by the fact that all milch animals above the age of 4 years are allowed to be slaughtered at present.

(b) The Corporation by its Resolution No. 4282 of 16th September 1923, prohibited the slaughter of all cows and she-buffaloes under 8 years of age. The object underlying the above resolution was apparently to a great extent an economic one. It was thought that by the prevention of slaughter of ALL animals under the age of 8 years the agricultural live-stock of the country would be increased resulting in an increased and cheaper supply of milk, butter and other milk products. This belief is, however, based on a fallacy. All animals below the age of 8 years which are being slaughtered at present at the Bandra slaughter house are not all useful animals and excepting the dry animals from the Bombay City stables, and which indeed in most cases are very

useful animals, the remaining ones are abandoned as worthless by the agriculturist, milk producers and others and these are brought by butchers from the districts for being slaughtered. The preservation of the latter class of animals raises two serious economic considerations. Firstly, the perpetuation of such useless animals will be a serious objection, from the cattle breeders' point of view, to the active improvement of the indigenous breeds. It may even become a menace to the existence of the few good breeds of animals that we have still left with us. From the economic uplift of the country eradication of the useless animals is as important as the systematic breeding of good animals, and if constant weeding out of the useless ones and their disposal through the slaughter house, which is the only economic method of disposing them, is prevented by legislation of the kind that is contemplated, the country which is already burdened, more than any other country in the world, with useless and unproductive animals will further be over-burdened with them. The result will be that during famine years, which are unfortunately not infrequent in this country, there will be scarcity of fodder, and a struggle for existence, between scrub type and the pure breed will ensue in, which according to the cruel law of nature, the former will be victorious over the purer and more delicate breed. Secondly, the prohiibtion of the slaughter of ALL animals below the age of 8 years may give rise to problems as regards the food supply of the non-vegetarian section of the country.

4. PROPOSED MEASURES.—Faced as we are with the peculiar conditions under which milch cattle are kept in the very heart of the city for milk; production, protection is needed to prevent indiscriminate slaughter of useful animals brought to Bombay. The ideal solution of the problem of course lies in the wholesale removal of milch cattle from the city and to replace the present method of milk supply by a supply from dairy farms or milch cattle centres far away from the urban areas under some such schemes as are at present engaging the attention of the Corporation. With the best of speed and the best of intentions, however, it is not anticipated that the stable in the city will disappear before a number of years yet. It is, therefore, necessary in the meantime to devise ways and means of meeting the problem of SAVING THE USEFUL ANIMALS WITHOUT PREVENTING THE SLAUGHTER OF USELESS ANIMALS. With this end in view, the last resolution passed by the Corporation should be so modified as to make it applicable only to milch animals brought to the city stables and not indiscriminately to ALL animals slaughtered at the slaughter houses. Further, to make the measure efficacious as far as the saving of prime and useful animals is concerned, the age limit should be raised from eight to twelve years. To give effect to the suggested measure it will be necessary to maintain a record of all animals imported into Bombay, and it is not anticipated that there will be any difficulty in doing this as there are only one or two places at which animals are detrained when brought into Bombay from upcountry. Before the animals are allowed to enter municipal limits, they should be examined and registered with such particulars as age, number of claving, names of importer and purchaser, etc., and a register number given to each animal which can be marked on the ear of the animal. This number will serve as a check when animals are taken for slaughter to the municipal houses. A nominal fee of Re. 1 can be charged per animal imported into Bombay which besides meeeting the expenditure which will have to be incurred

for extra staff, may also bring in some revenue to the Municipality without taxing the trade unreasonably. The animals saved under the proposed legislation will be returned to the breeding districts where they could be kept till their next lactation. It may be argued that useful cattle thus saved from the Bandra Municipal slaughter house would be absorbed by the slaughter-house at Kurla over which the Bombay Municipality has no control. But the cattle slaughtered at Kurla are slaughtered only for their hides, as there is no market there for meat, and the number of cattle slaughtered is always governed directly by the trade demand for hides. The number of animals slaughtered in Kurla will not, therefore, it is anticipated, exceed a certain limit.

5. DRY CATTLE FROM CITY STABLES.—Some explanation may here be given as regards the dry animals saved from Bombay stables. It may be said, and it has been said, that they cannot breed any more because (i) food given in the city stables is too rich in nitrogenous matter and on account of want of exercise fatty degeneration sets in and the animal is incapable of further breeding, and (ii) the pernicious " phuka " method practised by the gowlis in avoiding the animal while in heat to be covered in order that the animal may continue its milk as long as possible, incapacitates the animal from bearing calf again. While there is some truth in (i) it does not in itself form any unsurmountable difficulty. On the other hand, it has been ascertained that if the animal is served in right time instead of waiting till it gets dry, it bears calf like any other animal in spite of the rich food it gets. And this is being done at present by the city gowlis in the case of exceptionally good animals. As for (ii) if the gowli is forced to find some other market than that afforded by the slaughter-house he will automatically be driven to abandon the present pernicious practice and resort to the timely covering of the animal if he wants a customer for his animal, who must of necessity be a cattle breeder. This demand for pregnant animals from cattle breeders will also counteract the demand from Kurla or other slaughter houses outside the control of the Bombay Municipality.

6. ADVANTAGES.—The measures suggested by me will remove the legal difficulty that may perhaps arise in connection with the prohibition of the slaughter of ALL animals under a certain age and will mitigate the serious economic evils that must follow from the cutting off of the food supply of a large section of the non-vegetarian population of the city. It will further, directly or indirectly, offer inducements to the gowlis to keep their animals in the suburbs instead of in the city as at present and thus help in removing one of the great problems facing us both as regards sanitation and the supply of pure milk."

ANNEXURE II.

City Milk Supply and the slaughter of milch cattle (Zal R. Kothavalla, B.Ag., B.Sc., N.D.D., Dairy Expert, Bombay Municipality), 1924.

One of the most unsatisfactory features of the milk supply of cities in India is that the major portion of the supply is obtained from cattle stabled in the very heart of the cities. Taking the example of Bombay, nearly 78 per cent. of the total milk consumed is produced by about 15,000 head of cattle stabled in the city itself. This system apparently dates back to the times when there were no railway facilities and land in urban areas was cheap. The only merit contained in this system is that the milk is produced just near the place of its consumption and can be supplied fresh without raising any problems of transportation, but this is many times outweighed by the dangers which attend its production in a crowded city by methods which are very primitive. There is further the great danger to the health of the inhabitants on account of the proximity of the stables. Besides these objections from the point of sanitation, certain economic factors have arisen of recent years which make clean and cheap production of milk in urban areas economically impossible. The first step, therefore in the improvement of the milk supply of any Indian city is the removal of the stables from the town and the supply of milk from rural areas. Production on dairy farm should be the ultimate goal. But during the several years that must elapse between the substitution of a city supply by a country supply certain important economic problems arise which must be solved. Of these, the two most important are :—

(1) The slaughter of milch animals brought to city stables for milk production ; and

(2) the supervision of the milk supplied from the suburbs.

As regards the first, the slaughter of prime animals, it is not anticipated that the last stable in the city will disappear before a score of years yet. Till then the wanton destruction of useful animals will continue as at present if not checked. This practice, which exists to a fearful extent in Bombay, has not only drained the Bombay Presidency alone of its best breeds, but its effects are felt even in North India whence the Dlehi buffalo is imported in fairly large numbers for the Bombay milch cattle stables. Figures of the buffaloes slaughtered at the Bandra municipal slaughter-house annually show a rise from 8,371 in 1915 to 11,536 in 1922 ; this gives a vivid idea of the annual destruction of the precious animals and emphasizes the necessity of devising some measures.

The Bombay Municipality recently made a move in the matter by adopting a resolution for the prevention of the slaughter of all animals under the age of 8 years at the municipal slaughter-houses. This measure though full of good intentions will work to certain grave disadvantages in practice as far as the agriculturist is concerned, for the only venue of the disposing of the weedy and useless animals will be closed. At the same time some such measure as would save the useful animals without preventing the slaughter of useless animals is urgently necessary. With this end in view the measure requires, in my opinion, to be so modified as to make it applicable only to milch animals

brought to the city stables and not to all animals in general slaughtered at the slaughter-houses. Comments on this are invited. The proposal can be given effect to by maintaining a register of all animals imported into Bombay, in which age will be the determining factor. The animals so registered, if they are below the age limit, should be prohibited from being slaughtered at slaughter houses when they run dry. The adoption of some such measures appears to me to be the only remedy within the powers of the Municipality for the evil under the present circumstances. As for the animals thus saved, if proper inducements were offered by providing facilities for land by Government, not far away from the city, they could be kept till their next lactation either by individuals or through the efforts of limited concerns. Here a remark is necessary as to the experience in the past with these dry animals. It has been said they cannot breed any more and the reasons advanced are :—(i) That the food given in city stables is too rich in nitrogenous matter and on account of want of exercise fatty degeneration sets in and the animal is incapable of further breeding. (ii) The pernicious " phuka " method practised by the *gowlis* in avoiding to cover the animal while in heat incapacitates the animal from bearing calf again.

While there is truth in the first statement it does not in itself form any unsurmountable difficulty. On the other hand, it has been ascertained that if the animal is served in right time instead of waiting till it gets dry, it bears calf like any other animal in spite of the rich food it gets. And this is being done in the case of exceptionally good animals by the city *gowlis*. If any doubt is still felt about it the Local Government cattle experts should take up this question and thoroughly investigate it.

As for the second reason, if the *gowli* is forced to dispose of his animal when dry in any other way than to sell it to the butcher, by adopting some such measures as suggested above, he will undoubtedly be forced to abandon the present pernicious practice if he wants a customer for his dry animals, which must of necessity be a cattle breeder.

This question is brought before the Conference in view of the fact that the prohibition of the slaughter of the cattle is being decided upon by most of the principal municipalities in this country. At some places only a partial prohibition is carried out, while at places where religious sentiment is running high, total prohibition is advocated. The result of such a policy would be disastrous as far as the agriculture of the country is concerned and would prove ruinous to any scheme for the improvement of the cattle. The Conference, therefore, after debating on the question, should make its recommendations to the municipalities concerned and insist on co-operation from Government on the following points :—

(1) The inadvisability of the total prohibition of the slaughter of the cattle in municipal slaughter-houses as detrimental to the agricultural interests of the country.

(2) The desirability of protecting useful milch animals brought to the cities by some such method as suggested above.

(3) The desirability of substituting the present method of milk supply from cattle stabled in the city by a supply of milk produced on dairy farms in the country.

(4) The grant of conveniently situated land by Government at concession rates for the purpose of maintaining dry animals obtained from city stables.

(5) The grant of concessions by railways for the transport of dry animals from the city to the breeding grounds.

(6) Introduction of stud bulls by Government in the city stables.

As regards the supervision of milk supplied from the suburbs, this factor is more important from the point of health of the community than from any economic consideration. Mere removal of the cattle from the city to the suburbs or to any place beyond the municipal limits will not solve the problem of a cleaner and cheaper milk supply for the city. On the contrary, were the animals to be shifted to places where the municipality has no jurisdictive powers or where there is no organized system of supervision the milk imported into the city from such places will always be attended with grave dangers so that the remedy may prove worse than the disease, even if powers were obtained by the municipality by legislative enactments to control and supervise the areas round about which form the milk supplying sources of the city, due to the present unorganized state of the milk trade and the great number of herds in which the milch animals will be scattered. Supervision over the production by a single municipality will prove very difficult and expensive if not impossible. Production on dairy farms started for the prupose would be ideal and the only possible solution of the problem, but before this stage of perfection is reached measures such as would ensure a safe milk supply from the suburbs through efficient supervision are very necessary and discussion on this subject is invited. This, in my opinion, could best be achieved through the co-operation of the local bodies and the municipalities lying within a certain radius of the city to which the milk from those areas is supplied. This system can be given effect to by adopting a uniform and common standard of laws and bye-laws as regards the stabling of animals, sanitation, etc., so that when a permit for selling milk in the city is applied for by a producer his ability to produce safe milk could be attested to by the local municipality the Government must co-operate by taking up the responsibility and even extending the services of its inspectorial staff to the local municipalities whose revenue does not permit of adequate staff being kept for efficient control.

The advantage form such a control to the city will be that the public will be assured of a safe milk supply, while the local municipalities or the controlling bodies will gain by increased revenue obtained through the fees for stabling of animals within their jurisdiction.

ANNEXURE III.

Notes on Bombay milk supply and its improvement (1922) by Zal R. Kothavalla, Dairy Expert, Bom. Municipality : Wm. Smith, Imperial Dairy Expert, Kasauli.

It is generally admitted that the present conditions of the milk supply of the City of Bombay are unsatisfactory. The quality of the milk sold is generally bad, adulteration is the rule rather than the exception, prices are high and the milk offered for sale to the general public is far from safe from a sanitary point of view.

This condition of affairs is due to various causes the principal one being ignorance on the part, firstly of those engaged in the dairy industry, and secondly of the consumers, the general public. In other words the force of public opinion in Bombay up to now has not been sufficient to demand and secure a more satisfactory milk supply.

The milk supply of Bombay at this moment differs from that of all the great cities of Europe, America, and the colonies in that it is produced entirely within the city area or immediately adjacent thereto. In fact the milk supply of Bombay is now produced in the same manner as and under somewhat similar conditions to that of London, Paris and New York prior to the introduction of Railways and the commercial application of cold storage machinery. The advent of railways and the application of cold producing machines to the dairy trade very quickly stopped the production of milk in cities or suburban residential areas close to large towns. The milk supply of all the great cities of the world to-day outside of India is now produced by dairy farmers on purely rural areas, and after proper treatment to ensure its keeping properties, is railed into the cities and distributed from depots properly equipped and organised for the purpose. In no large city of the world which we know of was this change brought about by any legal enactments such as the prohibition of housing of cows within city limits or such like but the economic laws which govern the production and distribution of all products closed up the city cow shed with extraordinary rapidity, in that it is a self-evident fact that to feed, milk and look after a cow in the heart of a great city must be a very much more expensive business than to support the same animal under natural conditions on the land where the food is grown.

It should, however, be mentioned there that in all the large world cities the advance of public opinion in regard to sanitation was the means of hastening the elimination of the urban cow shed because improved sanitary conditions of life demanded more expensive cattle sheds and a higher and a more costly standard of cleanliness, ventilation, and general well-being for the city kept now. This is exactly what is taking place in Bombay to-day.

Public opinion is clamouring for the removal of the existing cattle sheds from the congested districts of Bombay to Trombay or elsewhere, although this move may be and probably is urgently requisite and necessary from a sanitary point of view, we most strongly hold that it will not solve the milk supply problem of Bombay. On the contrary as more rigid sanitary conditions are enforced and public opinion will see that they are enforced the cost of the city

or suburban produced milk will continue to increase and in Bombay the point in production cost is not far distant when the price will be so high that the man in the street will not be able to buy milk at all. Anything therefore in the direction of the removal of the existing city cow sheds to other urban or suburban sites is no solution of the problem. It can and must be solved in Bombay as it has been done in Paris, Berlin, Copenhagen, Chicago, London and New York, and every other large city outside of India by the introduction of a country milk supply produced from cattle fed, housed and milked in rural areas on the land where the fodder is grown and the dairy farmer is forced by economic conditions to keep his cow from year to year and to produce a calf from her year by year so long as she remains fit. The economic conditions governing the existing Bombay system force the cow feeder (he is only a cow feeder and not a dairy farmer) to slaughter the animal after one lactation period.

It is unfortunate that the Indian business man in the past has persisted on looking upon anything in connection with cow keeping as something concerning his religious sentiments than a business proposition, and it is largely because of this that private enterprise has not tackled the dairy industry in India and eliminated the town cow-feeder. We must however face things as they are and the task now before the Corporation of Bombay is to introduce into the city a supply of pure safe pasteurised new milk which will sell at a lower price than city produced milk can possibly be offered at, and which will eventually take the place entirely of the existing unclean supply.

There are several ways in which this could be done. The Corporation should take the initiative and start a large dairy farm of their own. They could subsidise all sound rural supplies brought into the city. They could subsidise the railway companies to carry such supplies at very low rates, or they could grant free sites, rebates of Municipal taxes, or other such facilities for the town distributing depots of rural milk companies.

After a full consideration, however, of the whole matter we are of opinion that the best and quickest result in the direction of effecting a real and permanent improvement of the city milk could be obtained by the Corporation guaranteeing for a period of say ten years interest at the rate of 5½ per cent. per annum on the capital of approved limited liability companies formed to produce milk at model dairy farms with sufficient lands, buildings and equipment and to supply the same to the city of Bombay. The Government of India successfully adopted this method in their endeavour to introduce capitalists to lay railways down in India and thereby develop the internal transport of the country.

The conditions under which a gaurantee on the above lines could be given may be as follows :—

(1) Corporation to guarantee interest on capital of approved companies at the rate 5½ per cent. per annum for ten years.

(2) Approved company to mean a limited liability company registered in India. The scheme for the promotion, working and location of such company to be drawn up in each case by the Imperial Dairy Expert and the Milk Officer of the Bombay Corporation conjointly.

(3) Plans of all dairy buildings, machinery specifications and schedule of live-stock of all approved companies to be drawn up by the Imperial Dairy Expert and the Milk Officer, Bombay Corporation and no concern to be considered an approved company which does not comply with the requirements of these officers in connection with these items.

(4) The Bombay Corporation through their technical advisers the Imperial Dairy Expert and the Milk Officer, Bombay Corporation to approve of all managers or managing directors appointed by approved companies and no firm to be considered as an approved company unless the management is approved of by these officers on behalf of the Bombay Corporation.

(5) Each approved company to guarantee to supply to the city of Bombay not less than 500 lbs. of pure fresh pasteurised milk daily for every Rs. 1,00,000 of capital guaranteed by the Corporation. This supply to commence within one year from the date of approval of the company by the Corporation.

Since our interview with the Municipal Commissioner we have been in communication with two groups of Bombay financiers concerning the capitalisation of such companies and we consider it probable that if the Corporation could agree to these conditions both these companies would materialise. One would operate near Talegaon and the other near Bulsar stations. The proposed capital for each would be Rs. 10,00,000 which would mean minimum supply of 10,000 lbs. new milk per day to Bombay. Should the Bombay Corporation favourably consider the proposal we can proceed with the detailed scheme for each of these companies. These detailed schemes would in addition to building plans, machinery specification, lists of live-stock, etc., include estimated trading accounts for the first, second, third and fifth years working and it is not unlikely that the Corporation would like to have those details before them before they finally commit themselves to the guarantee recommended.

It is our opinion that if these approved companies have sufficient lands, the proper class of animal and good management they cannot fail to be dividend earners. We don't think in pledging their credit in this way, to encourage the dairy industry in Bombay, the Corporation will ever be called upon to pay any interest whatever, provided the Corporation see that the approved companies have not to meet unfair competition, *i.e.*, that persons who sell a mixture of half water for new milk, are not permitted to compete in price with the approved companies selling pure milk. This the Corporation can do under their existing powers.

WILLIAM SMITH,
Imperial Dairy Expert.
ZAL R. KOTHAVALLA,
Dairy Expert,
Bombay Corporation.

ANNEXURE IV.

Present system of city milk supply and its drawbacks. (*Zal R. Kothavalla, B.Ag., B.Sc., N.D.D., Dairy Expert, Bombay Municipality.*)

(*Paper prepared for the Cattle Conference held in January 1924.*)

The problem of the milk supply in Bombay city is a most pressing one to-day, and I feel it might interest the members of the Board to know something of the difficulties which have to be contended with and the measures that are being taken to contend with those difficulties.

The problem is not of course confined to Bombay, it is common all over the country. It is vast and intricate and the efforts of one or more individual or of a city or Corporation, will not go very far. The problem must be tackled as a national problem. In Bombay city with a population of 11,75,914 the total quantity of milk consumed per day amounts to 23,000 gallons. That means that the *per capita* consumption amounts to 3·1 oz. This figure as compared with the *per capita* consumption in U. A. S., which amounts to 20 oz., and in the United Kingdom, which amounts to 10 oz., is very low. With its large vegetarian population, Bombay ought to consume more and it shows that if more milk were procurable more would be consumed. The supply is smaller than the demand and the present unsatisfactory and dear milk supply is the result. Of the total quantity of the milk consumed daily, 18,000 gallons, *i.e.*, 78 per cent. are produced within the city itself. To produce this quantity in all about 15,000 head of cattle are stabled in the very heart of the city. Of the remaining quantity, 4,855 gallons, *i.e.*, 21 per cent. are brought by rail from the suburbs and beyond, while the remaining 142 gallons, *i.e.*, 1 per cent. are brought to Bombay from outlying places by road.

The distribution of all this milk is being done either by the producers themselves or by retailing at milk shops and through city dairies. Of the last, it is very disappointing to find that there are only two or three which are worked on up-to-date principles of business and sanitation. The distribution of milk in the city leaves much to be desired. Little or no attention is paid to cleanliness in handling, while the method of transportation is crude and imperfect and the risk of contamination during transit is very great.

As regards control and inspection of the city's milk supply, it is unfortunate that I cannot deal with this part of the subject as fully as I would like to. Strange as it would appear, the supervision of the city's milk supply forms part of the duties of Assistant Health Officers in charge of the different wards. The city can boast of a splendid set of milk ordinances, but they are like arms lying useless without any soldiers to use them. Till 1922 there were only 5 Sub-inspectors to look after the milk supply of the entire city. These men, in addition to inspecting milk while in transport through the agency of about 5,000 milk vendors and a large number of milk shops and taking test samples for examination, had also to issue of summons and attend Courts. The effect of inadequate staff and the consequent inefficient supervision was reflected in the quality of the milk sold. In 1921 about 989 milk samples were

examined. Of these 650, *i.e.*, 65 per cent. were of adulterated milk. The amount of water added varied from 15 per cent. to 86 per cent. From the middle of last year, the work of taking samples was assigned to the Medical Inspectors in addition to the Milk Sub-inspectors. The number of samples taken every day increased from about 4 to 29. In 1922-23 the number of samples analysed amounted to 2,866. Of these, 1,760, *i.e.*, 61·4 per cent. showed adulteration. Up to June 1923, 2,464 samples were analysed. Of these 42·1 per cent. were of adulterated milk. It will thus be seen that since the inspectorial staff was supplemented and more rigid steps taken to inspect milk, the percentage of adulterated samples that were detected decreasing from 65 per cent. to 42 per cent.

The responsibility of the supervision of the milk supply and the licensing of the trade is not only divided amongst several executive officers, but it is even divided between two departments. The fearful child mortality of Bombay is as eloquent testimony to the imperfect method of production, distribution and supervision of the city's milk supply. It has now been definitely proved by the experience gained in some of the principle cities in U. S. A., that the milk supply has a direct bearing on child mortality. The price at which milk is sold in Bombay is 13 times dearer than in U. S. A. and 12 times dearer than in the United Kingdom. This high price of milk is due partly to the demand being greater than the supply but principally to production of 78 per cent. of the milk in the very heart of the city where conditions are anything but favourable for cheap production. Another very undesirable result of the system of stabling milch cattle in the heart of the city is the slaughter of prime animals brought to Bombay for the purpose of milk production. No fewer than 11,536 buffaloes were slaughtered at the municipal slaughter house in 1921-22, while at Kurla, a suburb near Bombay, almost a similar number was slaughtered. All animals come from the Bombay milch cattle stables and in most cases they are in the prime of life having been imported with the 2nd or 3rd calf. This unrestricted destruction of really useful animals that has been going on for so many years is causing a serious drain of the economic resources of the country of which the effects cannot but be felt. It is here that Government can be of great help by devising ways and means to meet this situation. The Bombay Municiaplity has already decided to put a stop to the slaughter of all the animals below the age of 8 years, with a view to save the wanton destruction of milch cattle coming to Bombay. But if this measure is not to result in harm in another direction, it should be confined only to the milch cattle imported for the city stables.

This state of affairs is not by any means one of which any municipality or executive body could feel proud, but it brings forth clearly both the importance and the extent of the problem to be solved. Not only is the trade required to be rebuilt on sound principles of business and sanitation, but before this can be done the deep rooted evils established by ignorant and unqualified producers are to be eradicated first. The Municipality was alive to the situation and its first efforts to bring about an improvement can be traced as far back as 1912. It was not, however, till the year 1915, that some results of these efforts were visible. In this year the Milk Committee appointed by the Corporation approached Dr. H. H. Mann to advice them

in the matter. The Committee could not have selected a better man for the purpose. At that time Dr. Mann, after studying the whole situation carefully, submitted in 1919 an interesting report over which he devoted considerable energy and labour. One direct and immediate result of the report was that the Corporation decided that no more milch cattle stables should be allowed to be erected in the city, and that on sanitary grounds the existing stables should gradually be removed to a suitable place outside the city, where the cattle should be housed in up-to-date stables with clean surroundings. It was also realised that for the purpose of reorganising the milk supply and devising ways and means to improve it, it was essential that there should be a whole-time officer. This brought about my appointment in April 1922.

As a first step toward reorganizing the supply of milk from the suburbs, the Municipality decided to build a set of model stables at Trombay about 12 miles from Bombay. The Development Department, which has undertaken the development of Trombay, has earmarked an area of about 350 acres for milch cattle stables, of which 40 acres are being acquired immediately. To begin with, it is proposed to construct a yard of four stables to accommodate 500 cattle with necessary buildings and the provision for paddocks for exercise and open ground for the grazing of the cattle. These stalls will be let out to *gavlis*, and in the case of owners of a large number of cattle, the Municipality may allow the owners to construct stables at their expense according to sanctioned plans on land leased from the area reserved by the Municipality. The Municipality will be responsible for water supply and sanitary services and it is hoped that a supply of electricity will be available also. With all these facilities and clean stables constructed on the most up-to-date principles the milk will be produced under almost ideal conditions. As regards the transport of the milk from Trombay to Bombay, there is a fine road connecting the two places and the Municipality will provide the necessary vehicles. Later, it is expected that there will be a direct connection by railway of which a beginning has already been made. In the light of experience gained, further stables will be erected at Trombay.

The Trombay scheme, while forming the basis of a suburban milk supply, cannot by itself solve the whole problem, unless it was supplemented by some other scheme to meet the enormous demand that will be created by the removal of cattle stables from the city. In the circumstances at present existing there was no private enterprise forthcoming to start a dairy farm unless some help was guaranteed by the Municipality. The only alternative to this was the starting of dairy farm by the Municipality itself. As regards the former, a private limited company proposes to start dairy farms at two places, one at Telegaon on the G. I. P. Railway and the other at Bulsar on B., B. and C. I. Railway. All the milk produced at these places would be sold in Bombay through the Company's agency. The company is prepared to grant the Municipality the right of inspection of the farm and the accounts and to take such measures as would ensure proper management of the concern. In return, the company has asked that a dividend of 5½ per cent. per annum should be guaranteed to the shareholders for ten years, the Municipality to make up the deficit in case the profits of the company do not allow

the payment of this dividend. The advantage of a private enterprise, even under these terms, to a municipal enterprise which has nowhere succeeded, are obvious. Both the proposals are at present under the consideration of the Municipality. I should not fail to refer here to the invaluable assistance received from Mr. W. Smith, Imperial Dairy Expert, both in connection with this scheme and the general policy to be adopted.

Even after the establishment of a suburban milk supply certain measures will be quite necessary as regards inspection and control of the milk, after it enters the city, to ensure a clean supply to the public. Unless there is proper and efficient supervision, the traders in unadulterated milk will have no chance against those who adulterate their milk with water. It is necessary to emphasize this point very strongly otherwise all the grandiose schemes for clean and cheap milk supply would come to nothing.

In the first place the present system of inspection, needs complete overhauling. The prime factors in efficient control and supervision are the centralisation of the administrative powers and an adequate and well-trained staff. These have been urged upon by all the Milk Commissions investigating the problem in various parts of the country, and wherever they have adopted a clean and safe milk supply to the public has been assured. The division of responsibility between more than one department and between different executives and the secondary importance given to milk inspection work where this forms part of the other duties of an official, has to a great extent been responsible for the present deplorable state of affairs. If any headway is to be made in the direction of improving the milk supply, it is in my opinion necessary to have a separate milk department, where all work in connection with the inspection, supervision. etc., of the milk supply could be centralized.

Before concluding I should like to refer here to public apathy in this matter ; whatever be the magnitude of a scheme involving the welfare of the public, progress with it is difficult, if not impossible, if there is no intelligent appreciation by the public of the measures undertaken. In order that the progress of the measures in contemplation by the Municipality may be expedited, co-operation from the public was sought for by making proposals which were conducive to a cleaner and cheaper milk supply. But neither an appeal to the religious sentiments of the people nor to the profits involved in the enterprises had any effect.

The whole situation has been and is under careful consideration. I must admit that very little progress has so far taken place and there is hardly any tangible result to which I can point with pride. But you will agree that progress must of necessity be very slow where a public body like Municipal Corporation is concerned, where the problem is so vast and intricate, where the evils connected with the problem have been deep-rooted for so many years and where we have to deal with a class of people of so backward a type as the *gowlis*. Fortunately there is at the head of the Health Department and also at the head of the Corporation officers who are keenly interested in this particular problem and they are doing all they can towards its solution.

ANNEXURE V.

The statistics of the milk supply of Bombay City, 1923, by Zal R. Kothavalla, Dairy Expert, Bombay Municipality.

In 1915 Dr. H. H. Mann worked out the statistics of the milk-supply of Bombay city, when he had been asked by the Municipality to examine the milk problem and make his recommendations for an improvement.

In June of this year a systematic survey was made of the city's milk supply and the following reliable figures will prove of considerable interest both to the general public and to those engaged in the study of the milk problem in this country.

The total quantity of milk that is being consumed per day in Bombay amounts to 22,997 gallons, *i.e.*, 229,970 lbs. As the population of Bombay according to the last census was 11,75,914, the consumption of milk per head works out to 3.1 oz. This, as will be admitted, is not what it should be, especially in a country like India where milk forms one of the principal articles of diet both of the rich and the poor.

Out of the total quantity, 18,000 gallons of milk, *i.e.*, 78 per cent. are produced within the municipal limits in the town-stables. Of the remaining quantity 4,855 gallons, *i.e.*, 21 per cent. are brought by rail from the suburbs and beyond. The farthest place from which milk is brought by rail is Kirkee on the G. I. P. railway and Nadiad on the B., B. and C. I. railway. The remaining 142 gallons, *i.e.*, 1 per cent. are brought to Bombay from the suburbs by road.

There are in all 93 milk cattle stables in Bombay City and these contain in all about 15,000 head of cattle. Of this number about 95 per cent. are milch buffaloes and the rest are cows.

The above figures do not compare favourably with those obtained by Dr. Mann in 1916 . It was then estimated that about 20,000 milch animals were stabled in the City. Out of the total supply of milk 83 per cent. was produced in the town-stables while 17 per cent. was brought from outside. The total quantity of milk consumed per day in the city was estimated to be 30,000 gallons in view of the fact that the population then was smaller than what it is at present the consumption of milk per head was higher than that of today.

This state of affairs is of course due to the rise in the cost of food stuffs which leave a poor margin of profit to the cattle-owner. The increased railway freights have not only added to the cost of milk transport but also have added to initial cost of the animal, and with the prevailing lack of funds all round inferior types of animals are now being purchased. The high rent of city stables ranging from Rs. 3/8 to Rs. 8 per month per head, the slaughter of prime animals after they run dry and the destruction of the calves of class animals stabled in the city, are other factors which have tended to accentuate the difficulty.

SUPPLEMENTARY NOTE ON SUBJECT NO. 11.

THE PRESENT POSITION IN REGARD TO THE SALVAGE OF DRY CITY COWS AND SUPPLY OF MILK TO LARGE CITIES.

By

MASQUD ULLAH S. JUNG,

Deputy Director, Incharge, Cattle Breeding, Jhansi.

1. *Dry Cattle Farms.*—The maintenance of cows in cities for city milk supply is an uneconomic practice as they have to be maintained on fodder, imported from outside. Cows are often housed under insanitary conditions. Calves are often neglected. Proper provision for breeding is not made which results in the dry period being extended and increases the cost of milk production and results in a very expensive city milk supply. The maintenance of dry farms will prove a very expensive and unsatisfactory undertaking. At present there is a practice of boarding out good cows with cultivators in villages during their dry period, the cultivator being given the calf and some reward. The establishment of a bureau in cities which will put city onwers of dry cows in touch with cultivators who are willing to " board " them on fixed terms during the dry period may prove useful as a temporary measure. The real solution of the problem lies in the removal of all cows from cities and the development of a city milk supply on up-to-date lines, from milk produced under the cheaper conditions in villages situated within a radius of about 20 miles of the city concerned.

Such a milk supply scheme has been working regularly for the last 12 years at Agra. About 12 maunds of milk is supplied daily from a village 7 miles distant under conditions which hygienically are a considerable advance on the usual city milk supplies.

Such supplies could be considerably increased by giving subsidies to railways and specially licensed motor lorries which with the assistance of bicycles for local collection, could tap large quantities of milk produced under hygienic conditions which could be placed in city markets. Legislation is to be enforced to prevent adulteration and to maintain an approved standard of hygienic purity.

In the Agra scheme milk is purchased from villages at 11 seers per rupee and is retailed to Agra consumers at 8 seers per rupee.

An attempt should be made to organise on these lines an up-to-date supply under legislative control. For purposes of the development of the scheme existing powers of control now vested in the Municipal Board, should be transferred to a special body set up for the purpose of the particular scheme.

NOTE ON SUBJECT No. 12.

REVIEW OF PROGRESS MADE IN PROVINCES AND LOCAL ADMINISTRATIONS IN REGARD TO THE RESOLUTIONS OF THE CATTLE CONFERENCE HELD IN MAY 1937.

It will be recalled that in May, 1937, a Conference composed of Provincial and State Ministers of Agriculture, their technical advisers and non-officials assembled in Simla to take stock of the situation arising out of His Excellency the Viceroy's cattle improvement drive and to decide on the lines on which the improvement could best be carried out. This conference discussed the subject from various aspects and a number of resolutions, relating to the establishment of Provincial livestock improvement funds, provision of better facilities for grazing, necessity for increased personnel and the possibility of planning rotations with a view to increasing the production of leguminous fodder, etc., were passed. It is considered desirable that, in order to provide a guidance for further development, a technical body like the Animal Husbandry Wing should consider the progress made in this matter.

2. A summary of the action taken by the Provinces and Administrations along with the subjects discussed at the Conference and the resolutions passed thereon is given in the attached statement.

3. It may further be observed that, in regard to Resolutions 1 (*ii*) and 2 (*e*) on Subject No. 2, with which the Imperial Council of Agricultural Research are concerned, a Central Fodder and Grazing Committee has been set up. This Committee has met twice so far and has considered schemes relating to this subject. The United Provinces and Bombay schemes have already been approved by the Governing Body of the Imperial Council of Agricultural Research.

4. The matter is now for the consideration of the Animal Husbandry Wing.

NEW DELHI;
The 7th February 1939.

S. BASU,
Secretary.

Summary of replies received from Provincial Governments and Local Administrations showing action taken on the recommendations of the Cattle Conference held in May 1937.

(A) Item on the Agenda.	The setting up of suitable provincial improvement funds on the lines suggested by the Animal Husbandry Wing of the Board of Agriculture as the best means of following up His Excellency the Viceroy's campaign for providing breeding bulls.	The improvement of grass lands and the better utilisation of waste and surplus land for fodder production and the initial steps to be taken in that direction by the various appropriate agencies.	The need for increased technical personnel required for livestock improvement work throughout India.	The possibility of crop planning for increased fodder production with special reference to leguminous fodders.
(B) Resolutions passed at the Cattle Conference.	*Resolution 1.*—The Conference having noted the response to His Excellency the Viceroy's appeal for the provision of funds for the purchase and maintenance of approved breeding bulls, being convinced of the necessity for a sustained effort to improve Indian livestock and of the importance of continuity of policy in all livestock breeding considers it desirable : (i) That there should be established in each of the Provinces represented a Provincial livestock improvement fund into which would be paid donations or other monies received for the purchase and maintenance of breeding bulls and for other forms of livestock improvement. It is a sound principle that most of the money should be spent in the district in which it was collected.	*Resolution 1.*—With a view to securing systematic and progressive improvement in grazing and grass-land areas, and the conversion of waste land into useful grazing, wherever that is possible on an economic basis. The Conference recommends: (i) That, in all Provinces standing Fodder and Grazing Committees should be established on the lines recommended by the Board of Agriculture and Animal Husbandry in India ; and (ii) That a central committee to co-ordinate grass-land and fodder research and the dissemination of information should be set up by the Imperial Council of Agricultural Research.	*Resolution 1.*—The Conference is convinced of the need in every Province for a Livestock Division with a separate allotment of funds for livestock improvement work and controlled by a livestock expert whose whole time is devoted to that subject. It is probable that the ultimate solution in each province will be found in the eventual establishment of unified department under one Minister embracing Plant Industry, Animal Industry, the control and prevention of animal diseases, the marketing of crop and animal products and rural cooperation with technical heads for appropriate divisions.	*Resolution 1.*—The Conference being convinced of the need for a greater attention to the improvement of fodder and its best use for deliberate crop-planning directed to the greater production of fodder crops recommends that such special effort should be made and such planning should form part of the regular propaganda by the agricultural staff in all Provinces. Details must vary greatly with local conditions but the fullest advantage should be taken of all favourable opportunities such as are afforded by the spread of high yielding varieties of cash crops and the development of more intensive cultivation due to new irrigation facilities.

(*ii*) That there should be set up in each Province either a provincial Livestock Improvement Board with suitable district or local committees or a provincial Livestock Improvement Association with district branches. It would be for each province to decide what form of organisation to adopt. It would largely rest with district and local committees or branches to maintain local enthusiasm and raise funds, and

(*iii*) That there should be the closest possible liaison between the several Ministers of Agriculture and such Boards and Associations. The precise composition and functions of these bodies is a matter for the province to determine, but it is desirable that the Minister should be president except where that position is occupied by the Governor of the Province in which event the Minister would be Vice-President. It would be an advantage if such bodies include in their membership the permanent officials connected with livestock improvement. Provincial Livestock Improvement Boards would not undertake administrative functions.

Resolution 2.—Whilst recognising that conditions vary greatly in different Provinces and localities the Conference agreed upon the following general conclusions :

(*a*) The report of the Special Committee on Forest Grazing shows that contrary to popular belief this is not only Reserved Forest problem but even more a problem of waste lands ;

(*b*) That great improvement in existing grass lands is possible by controlling the periods during which individual areas are open to grazing and by limiting the number and species admitted. Without such control deterioration is progressive and frequently the poorest cattle are found where grazing is unrestricted ;

(*c*) That good grazing is essential for the production of hardy young stock especially of the draught breeds and is therefore of special importance in all definite cattle-breeding areas ;

(*d*) That it has already been shown by experiment that, under control, several types of waste land can be improved to yield an appreciable amount of grazing and hay ;

Resolution 2.—Additional staff of all grades is required for livestock work and much can be done by the creation of a class of trained stockmen ; Provided that the Head of the Livestock Division has an adequate supervising staff.

Resolution 3.—It is also suggested for the consideration of provinces that the best possible use should be made of existing staff and, in particular, that in those provinces which have not completely provincialised their veterinary staff there should be a clear division of responsibility for veterinary work. Local bodies might be responsible for the maintenance of veterinary hospitals for the treatment of ordinary diseases and casualties and should retain control of the veterinary assistant surgeons required for that purpose. The rest of the veterinary assistant surgeons would form a disease control staff at the disposal of the Directors of Veterinary Services and these assistants could render substantial assistance in livestock improvement work.

Resolution 2.—**The Conference recommends that the above Resolution be commended to the notice of Indian States for their careful consideration and such action within their own territories as may suit their special conditions.**

	ne Conference noted the unanimous opinion of the provincial Ministers that the Central Government should make substantial grants to provincial livestock improvement funds. *Resolution 2.*—The Conference endorses the recommendation of the Cattle Improvement Sub-Committee of the Board of Agriculture and Animal Husbandry that adequate and suitable provision should be made for the proper maintenance in such a manner as may best suit local conditions, of all breeding bulls which may be presented in future.	(*e*) That there is scope for much useful experimental work on grass-land improvement in many parts of India and that definite schemes of experimental work should be initiated by the Provincial and Central Fodder and Grazing Committees and by the Forest Department in Forest lands.		

(C) Action taken by the Provinces and Local Administrations.

1. Madras ..	The question of starting a Livestock Improvement Fund and setting up of a Provincial Livestock Improvement Board or Association is under consideration of the Government. The bulls presented are maintained under proper conditions.	A Provincial Standing Fodder and Grazing Committee has been recently constituted. The Livestock Development Officer, Chief Conservator of Forests, Chief Engineer (Irrigation) and the Director of Agriculture are amongst the members. The suggestions in Resolution 2 will be examined by the Provincial Fodder and Grazing Committee recently set up.	The Livestock Section in this province has been placed under the control of the Veterinary Department. Government do not propose to consider now the question of the formation of a separate Live-Stock Division. A proposal for training stockmen is under consideration. The entire veterinary staff, both curative and preventive, is under the control of the Director of Veterinary Services. Even where veterinary institutions are subsidised by local bodies, the management and control are	In order to encourage the growth of fodder crops special concessions by way of exemption from water cess are granted. The Government have recently ordered that in order to improve fodder supply a programme of work should be drawn up by the Director of Agriculture in consultation with the Chief Engineer for Irrigation and the Board of Revenue for the systematic planting of areas in charge of the Irrigation Department with improved grass. In order to encourage the growth of fodder crops the Govern-

			retained in the hands of the Provincial Veterinary Department.	ment have also ordered that a portion of land suitable for the cultivation of fodder crops under irrigation projects should be specifically assigned for the purpose and that in the case of every new irrigation project percentages of the land to be commanded by the project should be reserved for growing.
2. Bombay ..	Government propose to constitute a Rural Development Board which will include among its functions those of a Livestock Association. Existing arrangements for maintenance of gift bulls will continue pending establishment of Rural Development Board.	A Provincial Fodder and Grazing Committee has been constituted. Resolution 2 will be examined by the Provincial Fodder and Grazing Committee.	(1) The further promotion of coordination by appointment of a Rural Development Commissioner is under consideration. (2) Government has decided to employ trained stockmen under the D. V. S. and to increase the supervising veterinary staff from next financial year provided funds permit. (3) Local bodies maintain Veterinary Dispensaries for treatment of ordinary diseases and casualties and Government supplies them free services of Veterinary Assistant Surgeons. In addition Government maintains a reserve staff of Veterinary Assistant Surgeons for the control of epidemic diseases.	The develpment of sources of fodder will be the principal duty of the Provincial Fodder and Grazing Committee.
3. Bengal ..	(1) On the advice of the recently instituted Animal Husbandry Board District Cattle Improvement Associations have been formed. As regards the establishment of a Cattle	(1) The question of the establishment of a Provincial Fodder and Grazing Committee was considered by the Animal Husbandry Board who were of the opinion that	(1) It has been decided to create a separate branch of Animal Husbandry with adequate staff including trained stockmen and supervising staff. The branch	The growing of fodder crops in Bengal is a difficult problem as much of the land goes under water for several months of the year. Of the many fodder crops tried the perennial

	Improvement Fund, the present practice in this province is for private contributions received in connection with cattle improvement work to be expended by District Officers for cattle improvement in their respective districts. It is intended to continue this system and to leave the formation of a Provincial Fund to the formation of a Povincial Cattle Improvement Association. (2) Adequate and suitable provision has been made for proper maintenance of all breeding bulls presented.	such a Committee would be unnecessary in Bengal for the reason that the amount of waste land under Government control is small. The Animal Husbandry Board will be capable to collaborate with the Central Fodder and Grazing Committee. (2) The Senior Conservator of Forests has submitted a short account of the situation as regards grazing with suggestions for improvement for the consideration of the Government.	will be fully equipped within 4 years and will then be placed under the control of the Livestock Expert as head of the Animal Husbandry Branch. For the present the Livestock Expert will be under the control of the Director of Agriculture, Bengal. (2) In Bengal, except rural co-operation, all the other branches referred to are under the control of one Minister. (3) Under the consideration of the Government.	Napier Grass has been found to be the heaviest yielder and the growing of this has been encouraged by the free issue of cuttings or their issue at a very nominal rate. Another useful crop is Kheshari (Lathyrus sativus) which is grown after the Aman paddy is harvested. This practice seems to be spreading. There seem s also to be more Maize, Juar, and Kalais being grown in some of the districts than formerly. Demonstration has also been given for silage making in small pits with different fodders. The 2nd Economic Botanist and the Livestock Expert are working on the selection of high yielding fodders of various kinds.
4. United Provinces.	(1) As regards the establishment of a Provincial Livestock Improvement Fund, Government have not considered this necessary. They have during the current year provided a sum of Rs. 4 lakhs for veterinary work in addition to the usual provision of the budget of the Veterinary Department. Ample provision has thus been made by the Government for the purchase and distribution of bulls and for other items of cattle welfare work. As regards the second part of the resolution that there should be set up in each province	A Standing Fodder and Grazing Committee was constituted in June 1937. A number of schemes for experimental work in waste and ravine land have been prepared and some are awaiting allotment of funds from the I. C. A. R. The Provincial Government have also appointed a Special Officer with suitable staff to take up the work of developing the improvement of grazing lands and the afforestation of waste lands and ravine areas. They fully endorse the conclusions mentioned in the Resolution.	(1) A beginning has been made in the Province by transferring the administrative control of cattle welfare and livestock improvement work in five selected districts to the C. V. Department. At present there is paucity of Veterinary staff trained sufficiently to undertake not only the prevention and control of cattle diseases but also other work connected with animal husbandry such as the improvement of breeding the development of fodder crops and dairy farming. It is possible to start the experiment	A comprehensive programme for rural development has been drawn up and action is being taken. The development of fodder crops as part of the rotations will be among the duties of the agricultural staff.

	a Livestock Improvement Board with district or local committees, it may be observed that the organisation set up by Government is expected to meet the requirements fully. They are appointing a Provincial Board to advise on matters connected with animal husbandry and agriculture. As regards the third part the closest possible liaison between the various departments concerned is already in existence on account of the fact that the departments are in the charge of the same Minister. (2) The organisation set up by the Government fully ensures that the bulls are properly maintained.		on a small scale. The Departments of Agriculture, Veterinary and Cooperation are all under one Minister. (2) Government are making arrangements for training 250 stockmen who will work under the Veterinary Assistant Surgeons in charge of the various rural dispensaries and arrangements are also being made for the appointment of more Veterinary Assistant Surgeons to perform supervisory functions. (3) At present it is not considered feasible to provincialise the entire Veterinary staff and the responsibility for veterinary dispensaries and hospitals continues to be with local bodies. The Provincial Government have a Headquarters staff to control epidemic diseases, supervise cattle fairs, etc.	
5. Punjab ..	(1) and (2) Suitable arrangements already exist and the work is proceeding satisfactorily.	A Standing Provincial Fodder and Grazing Committee has been established. (2) The recommendations are being brought to the notice of the Provincial Fodder and Grazing Committee.	(1), (2) and (3) The organisation for livestock improvement in the province is already run on similar lines.	The Recommendations were adopted at a conference of the Provincial Cattle Breeding Committee held in November 1936. Since the appointment of a Fodder Specialist in 1926 important fodder crops like Berseem, Sudan Grass, Cawpeas, Elephant Grass, etc., have been introduced. Good seed of these various new fodders are being adequately supplied. Leaflets on various improved fodders are being issued from time to time.

6. Central Provinces and Berar.	(1) A Provincial Livestock Improvement Fund was started on the 13th March 1937. (2) A Livestock Improvement Association has been founded and District Committees have also been formed.	The question of establishing a Standing Fodder and Grazing Committee is being examined. Pending establishment of the Fodder and Grazing Committee the 2nd Economic Botanist is working on grass experiments in selected areas.	The recommendations are being examined and a further report will be sent in due course.	

7. Bihar .. The Government of Bihar have not been able to take any definite action to give effect to the recommendations of the Cattle Conference. They are considering the possibility of taking up livestock improvement work as a part of the rural development scheme which has just been started in the province. As regards the establishment of Provincial Fodder and Grazing Committee, the matter is under examination.

8. Assam .. The bulk of cultivable waste lands is under the control of the Revenue Department and investigation would require laborious field examination by a rather large body of officials equipped with revenue as well as agricultural experience. There exist rules for the grazing of cattle in unclassed state forest, for the purpose of preventing over-grazing and for selecting breeding bulls. Research into the values of indigenous and imported fodder grasses and propaganda as to growth of fodder crops is being carried on. A Provincial Fodder and Grazing Committee has been set up.

9. N.-W. F. P.	(1) A fund has been opened as proposed. A Provincial Live stock Improvement Board with District Committees is being constituted. (2) Adequate arrangements already exist for the maintenance of all stud bulls.	(*i*) The proposed Livestock Improvement Committee will also deal with fodder* and grazing problems. (*ii*) The recommendations will be considered by the Provincial Committee. *(A fodder and Grazing Committee has since been constituted).	(*i*) and (*ii*) An increase in the number of Veterinary Stock Assistants from 6 to 12 has been sanctioned. The resources of the Province are not sufficient for the opening of a separate livestock division.	Efforts will be made to sanction 2 additional posts of Agricultural Assistants to analyse the results achieved and assist in applying the lessons learnt to the zamindars holdings.

10. Sind .. Government has decided to hold a Livestock Conference to implement the resolutions passed at the Cattle Conference. The question of holding the Conference has been deferred till the appointment of a Livestock Expert in Sind (Livestock Expert in Sind has since been appointed).

11. Orissa ..	An Association called the Orissa Cattle Breeding Association was started in October 1936 on the lines suggested by the	The question of establishing a Provincial Fodder and Grazing Committee is under consideration.	(*i*) and (*ii*) The question of appointing a Livestock Officer is under consideration. Government have sanctioned	Demonstration in fodder crops has increased and stress is being laid not merely on fodder grass but mainly on fod-

	Conference. The funds of the Association include Government contribution of a non-recurring grant of Rs. 10,000 and a recurring grant of Rs. 1,500 for cattle shows. The Association has under consideration certain schemes for the improvement of Goshalas in the Province and the growth of fodder crops in waste lands and on the river embankment.		the training of 24 stock-men in cattle breeding and cultivation of fodder crops. (*iii*) Any attempt at controlling diseases should have only one authority. Dual control, as it exists, may result in inefficiency. The old system is working without any loss of efficiency and Government do not propose taking action on the recommendation of the Conference.	der crops like mung, maize, etc. Demonstrations are being given on ensilage of fodder crops. A few Veterinary hospitals grow fodder crops for demonstration and also for feeding the Orissa Cattle Breeding Association bulls. A short course of practical training in growing fodder crops and in making of silage was given in 1937 to the Veterinary Assistant Surgeons at Cuttack and Sambalpur.
12. Delhi ..	(*i*) The size of the Province is very small and a Provincial Livestock Board of Association would be out of place. The present arrangement by which funds available for livestock are paid to and administered by the District Board is quite effective. (*ii*) The existing arrangement is that the village community to which a bull is given is responsible for its proper maintenance. More formal arrangements are prohibitive on account of the expense involved.	(*i*) The scale of operations in Delhi is too small to justify the appointment of Committee, etc. (*ii*) There is one reserved forest but it cannot be used for grazing. Privately owned waste land is unevenly distributed and it is impossible to get the people to agree to rotational closures of small grazing grounds. Government owned waste land on the bank of Jumna is subject to regular flooding and is unsuitable for experiments. Consolidation may lead to better management of privately owned waste land.	(*i*) and (*iii*) do not apply. (*ii*) Stockmen are being appointed to all rural Veterinary hospitals. They will work under the supervision of and in the area allotted to the Veterinary Assistant in charge of each hospital.	During the past two or three years it has been possible to convince a few intelligent farmer of the value of berseem as opposed to the ordinary *senji*, and it is hoped that within three or four years berseem will be very widely cultivated. In addition propaganda has been done on the subject of green fodders and how to secure a supply of them all the year round. Consolidation will, in this matter also, afford an opportunity for more definite improvement.

13. Baluchistan	19 selected bulls have been located at Tahsil headquarters for the improvement of cattle. It is considered that the opening of a farm in Karachi for the famous Bhagnari breed of bulls might yield advantageous results, but funds cannot be raised locally for any such scheme. Owing to peculiar conditions prevailing in most parts of the Province the problem of improving grass lands in Baluchistan is a difficult one. The chief livestock of the province consists of sheep and goats and not of cattle. The people are nomadic and their main occupation is sheep-rearing. They move from place to place for grazing their flocks. Owing to tribal differences between neighbouring tribes free movements. except in masses, outside their ordinary limits are restricted. Within their own spheres grazing rights are owned by the inhabiting tribes and without the existence of any previcus lien in the shape of customary grazing, access to those areas by others cannot be allowed. Rainfall is scanty and the evolution of a scheme for the improvement of grass and fodders presents many difficulties. Grazing in State Forests has often to be allowed. The people are poor and the population too scanty and it is not possible to raise funds by subscriptions. A scheme for the introduction of a measure of rotational grazing in certain villages is under consideration. The object is to conserve grazing and vegetation and to prevent further deterioration of waste lands by erosion.			
14. Coorg ..	A proposal for the establishment of a fund on a small basis is under consideration. Little money can be raised in Coorg but with the Central Government grant and local subscriptions it will be possible to supplement the allotment from the Rural Development grant. The fund will be expended on the purchase of bulls and their maintenance in the breeding farm. (*ii*) and (*iii*). The fund will be organised by an Advisory Board known as the Livestock Improvement Board consisting of officials and non-officials. Suitable provision will be made for the proper maintenance of breeding bulls presented in future.	(*i*) There are unlimited grazing facilities for the ryots, both on Government reserves and non-reserves and large tracts of forest land given to ryots for grazing and other purposes subsidiary to cultivation. It is not necessary to form such a committee. (*ii*) The problem of deterioration of grazing lands is not so serious. It is hilly country without an extreme climate and with a sparse population and in almost entirely covered with forest land which can be utilized for grazing. In Government reserves grazing is limited to 6 months. Grazing is improved by destruction of lantana which covers very large areas.	The proposed organisation is impracticable in such a small areas as Coorg but the Veterinary Department has been placed in charge of livestock improvement work.	Efforts are being made to develop and popularize fodder crop and the Agricultural and Veterinary Departments are increasing the number of their experimental and demonstration plots for growing fodder and exotic grasses. These Departments will conduct regular propaganda on the lines indicated.

15. Ajmer-Merwara.	(i) An Ajmer-Merwara Cattle Improvement Fund has been started. A Cattle Improvement Committee consisting of 10 officials and 17 non-officials has been formed. The Committee will suggest ways and means for the improvement of cattle in Ajmer-Merwara. Breeding bulls have been purchased from the Rural Uplift and District Board Funds. The Cattle Improvement Committee have made certain suggestions for the proper maintenance of stud bulls.	The Cattle Improvement Committee will do the work of the Fodder and Grazing Committee. Grass lands for supplying grazing and grass consist of (1) Government Reserved Forests and (2) Village Commons (Shamlat Deh). Government forests are managed by the Forest Department and grazing incidence and the period have been carefully fixed and the grass lands have been well preserved. Village waste land is about 13 times the area of the Government land and have not been managed under any system. Unlimited grazing has been allowed throughout the year for the last 70 years, the forests have deteriorated greatly and erosion of the soil has been almost marked. For the improvement of these lands the following steps are to be taken. (a) In those villages which have applied to Government for proper management the lands will be divided into fenced compartments which will be grazed in rotation. (b) In those villages which have not applied propaganda will be made for approaching the Government for such assistance.	At present there is no Agricultural or Animal Husbandry Officer. Steps have been taken to appoint officers to look after plant and animal husbandry work. The question of recruitment of staff for livestock work will be considered thereafter. The question of appointing a disease control staff will also be considered after the appointment of the officer.	There is no agricultural department in the province. Experimental and demonstration farming work and some other works financed by the Rural Uplift Fund have been carried out. Further steps regarding the improvement of fodder crops will be taken when the Agricultural Officer has been appointed.

NOTE ON SUBJECT No. 13.

PRACTICAL MEASURES FOR THE IMPROVEMENT AND CONTROL OF GRASSLAND.

I.

By

W. BURNS, D.Sc., C. I. E.,

Agricultural Commissioner with the Government of India.

The grasses form a natural order of great distinctness. Their ability to stand grazing is due to—

(1) the power of grasses to tiller,

(2) the massing of buds near the surface of the soil, and

(3) the basal growth of the leaf.

The grass and the animal form parts of one system which, if balanced, permits of benefit to both. Other factors in the system are soil and climate.

Stapledon has no doubts as to which factor in the whole complex is the most important. In his opening address to the Fourth International Grassland Congress at Aberystwyth in 1937, he said :—

> " Soil, climate, grazing animal. Which of these three is the most important factor ? Most emphatically the grazing animal.
>
> Manure right, sow right and manage the grazing animal wrong and you are nowhere. Without the grazing animal there would be no grassland worth the name anywhere in the world. Management is, therefore, the key to the solution of the whole grassland problem. The real point is this, the animal makes for itself its own grassland."

In India, we are only too painfully aware of the damage done by overstocking. All practical measures which we advocate must have as their uncompromising demand the reduction of the number of animals grazed to what the area can reasonably feed. It is this demand which is most resisted by cultivator and administrator alike. The lines of advance must be—

(1) demonstration projects which compare uncontrolled grazing against grazing with a reasonable number of animals,

(2) local investigations into the number of useless cattle and propaganda to reduce their number,

(3) the development of additional cultivated fodder supplies.

The other factors, soil and climate, will determine very largely the other measures to be taken for improvement of grassland. To quote Stapledon again :—

> " The first necessity is to classify our grasslands, and to understand their interrelations, and then to work and to plan on the basis of clearly defined regions...natural regions."

The rainless weather of from five to seven months which is the rule over the greater part of India is our most severely limiting factor. It means that the above ground parts of grass plants dry up and are liable to fire. It means an interruption of growth, grazing and the development of vegetable cover.

It means that ploughing up of grassland is, in poor rainfall areas, a hazardous experiment, since the dry weather means the death of the ploughed-up grass and the result of the rains spells erosion of the disturbed soil. I find this danger emphasised by J. W. Rowland of S. Africa in his paper to the Grassland Congress in 1937.

Our methods in most areas must be the repair, almost the salvage, of the natural grass vegetation, which vegetation will often be of the nature of perennial grasses, tending to grow into larger or smaller tussocks, along with a certain amount of non-grass vegetation of uncertain feeding value. These weeds tend to increase as the grass proper decreases. Our management methods must be such as to prevent tussocks getting too big or too hard and this means that cutting must come into our programme somewhere.

Soil treatment can be limited to simple anti-erosion measures of all kinds, according to rainfall, slope and soil. Artificial manuring is out of the question at present, except as an experiment. Since cow dung is collected even from grazing grounds we cannot look to it for any soil improvement, except from such fragments as are left, and from the urine. Rotational grazing in addition to its other benefits tends to concentrate such natural manuring.

The following are some suggested programmes of grassland improvement for one or two out of many possible sets of conditions in India :—

They may be regarded merely as models to be altered in any way desirable. They have behind them a certain amount of experience in India and a certain amount of confirmation from similar work in other countries. It is assumed that in every case the areas are badly overgrazed.

I.

Conditions :—Low rainfall (20 inches and below), poor shallow soil, land mainly flat or with a very gentle slope.

In an area of this type it will take 20 years to show results. The surface should be covered with a network of low bunds (six inches high, nine inches broad at the base) the bunds forming rectangles with their long axes across the slope. These rectangles should be of say 1/10th of an acre each. In the first year there should be no cutting till the seed has fallen. In the second and succeeding years, one-third of the area may be cut at the flowering stage, one-third cut after the seed has fallen and one-third lightly grazed for the second half of the monsoon. The same third should not receive the same treatment in any two successive years. Where the grass is speargrass the cutting at flowering *time* must be done while the spears are still soft and after flowering when the spears have fallen or been combed off.

II.

Conditions :—Medium rainfall (20--60 inches), medium soil, land flat or within a very gentle slope.

A year's rest will do such an area a lot of good. Cutting may be permitted after the seeds fall or the ripe seeds may be collected and scattered on the area. Cattle may then be allowed to wander in the area and pick up what they can, adding urine. Contour bunding is recommended. In the second

and successive years, a rotational programme may be followed, with one block (a different one each year, of course), closed early enough to let seed form and drop. It can be then cut.

III.

Conditions :—Heavy rainfall (over 60 inches), medium soil, land flat or with a gentle slope.

It is suggested that the stock be kept off the ground till the grasses get established and that rotational grazing be then practised, keeping one or more blocks for silage-making in the middle of the rains and following on with grazing on these plots. Certain blocks after grazing should be closed early to allow seed to form and drop. These may be cut afterwards.

IV.

Where irrigation water is available, many more things are possible than under rainfall conditions. For example, it is possible to combine the reclamation of alkali land with a grazing and cropping programme. Sir Edwards Cole's method is to plough alkali land nine inches deep, go over it with a horse hoe and then with a log, puddle it and plant *doub daman* and *janewa* grasses and shaftal. This is left down for two years and grazed. In the following two years the grass is ploughed up and a crop of oats is taken. Thereafter the land is put down to grass and shaftal for another two years. (The United Provinces Forest Department has already shown that mere protection from grazing in the rains enormously increases grass production in *usar* areas). At the sugarcane research station at Padegaon in the Bombay Presidency it has been found that, particularly in light soil, leaving sugarcane land uncultivated and un-irrigated for a year and allowing it to carry a crop of weeds, has meant a considerable increase, up to 20 per cent. in the amount of nitrogen in the plot. A local leguminous weed—*Alysicarpus belgaumensis*—has been a prominent member of the flora of such plots, but the weeds were by no means all leguminous.

The introduction of grassland into a rotation in India depends, I think, mainly on whether we can find suitable Indian grasses, which would be helped by one watering at the beginning of the season. With them would have to be mixed a liberal amount of wild Indian legumes of which *Alysicarpus* and *Phaseoluss* species are promising. I see no reason why some such phase should not be introduced into any mixed farming scheme where even one watering is available, or where rainfall is of the 40 to 60 inches type normally. We should then be getting on towards that type of soil enrichment by the combined use of grass and stock which is so well shown by Stapledon's work.

To keep tussock grasses down to reasonable proportions and to prevent differential grazing, *i.e.*, to utilise all the vegetation as far as possible, it is suggested that in all experiments, towards the end of each season, animals other than cattle (*i.e.*, sheep or donkeys) should be allowed to graze in blocks intended for grazing or after the necessary cutting has been done.

There is time for treatment of a few subsidiary points in grassland improvement—

Introduction if new species from other countries.—There is every reason for trying as many of these as possible. One hit in fifty years would justify

such experimentation. Timothy grass was introduced from England to Carolina in 1720 by one Timothy Hansen. It underwent a change there and came back to England as a new, possibly hybrid race with enhanced value. Kikuyu grass used to be carried by migrating Africans to stock pastures in their new homes, and has established itself in certain limited conditions in India, such, for example, as the Upper Government Farm at Shillong where it tolerates even the shade and fallen needles of moderately spaced pine trees. At the present moment some of the African *Digitarias* are being tried by Mr. Smythies in the United Provinces. Sir Edward Cole has tried subterranean clover and strawberry clover in the Punjab in irrigated land. Both grow, but die out in the hot weather each year and do not produce seed. In order to see it seed can be produced in India, the two clovers are now being grown in Kashmir under the supervision of the Director of Agriculture, by the Superintendent of the Botanic Garden at Ootacamund, and at Muktesar. Trials have also been made with both clovers at Lyallpur where the strawberry clover (which is a perennial) seems promising and stood up to the hot weather of 1938. At Sir Edward Cole's instance, trials are also being made of Ladakh lucerne. Apparently the U. S. Department af Agriculture has known of this variety for some time. It is a robust drought-resisting type and can hold its own with grasses.

Collection of seed of Indian grasses and using them to re-seed grasslands.—The cost of collection is somewhat against this practice, and in some places germination has not been good, but the method seems to have given good results in the *taungya* plantations of the United Provinces described by Mr. Howard at the last meeting of the Central Fodder and Grazing Committee. The area selected for this experiment was in soil consisting of a dry sandy loam with pebbles (waterless Bhabar tract), with a 50-inch rainfall (July-September). The interspaces which had carried crops between the trees were ploughed up before the rains, sowings were made on ridges, patches and broadcast, and rootstocks of grasses planted at 2½ feet intervals. One to two weedings were carried out in July and August in the first year and one in August in the second year. The results are very promising. It would be valuable to have the germination capacity of any seed in such experiments properly tested in the laboratory in all cases.

Use of salt.—The placing of lumps of rock salt as licks to attract animals to particular patches of vegetation is used a good deal in American projects. In Poona it was also found of great advantage, ensuring the consumption of course grass that would otherwise have remained uneaten. Gorrie also strongly recommends this practice.

I have taken for granted major anti-erosion measures ; live or wire fencing, mud or stone walls, or herdsmen, to keep cattle on the blocks in any rotation series ; and a water supply also.

I would, in conclusion, like to redirect the attention of all concerned to Dr. Maclagan Gorrie's book " The Use and Releas eof Land " (Clarendon Press, Oxford, 1935) which discusses these and kindred matters from the point of view of planned farming and land use which point of view is the one we need to emphasise now.

II.

By

W. S. READ, P. V. S.,

Superintendent, Government Cattle Farm, Hissar.

Practical methods for the improvement and control of grasslands cover a very wild field, and include amongst others, such items as :—

(*a*) Cultivation operations.
(*b*) Rain conservation operations.
(*c*) Enclosure and division of grasslands.
(*d*) Rotational grazing.
(*e*) Re-seeding with good grass.
(*f*) Re-afforestation with edible trees and shrubs.
(*g*) Manuring and fertilising.
(*h*) Control of grazing.

An attempt to deal with such a varied number of items in a single article, could only be very sketchy. The time may, therefore, be more usefully employed in a more detailed consideration of one item only, leaving the remainder for future meetings.

One of the most important of the items tabulated above is " (*c*) Enclosure and division of grasslands ". Very little progress can be made in " Practical methods for the improvement and control of grasslands " until grazing areas are properly enclosed and sub-divided.

The more usual methods of enclosing lands are, " live " hedges, fences of dead thorn, wire fencing, and walls. The draw-backs to the use of these methods in India are briefly as follows :—

(i) "*Live hedges* ".—At present very few plants, which make good cattle-proof " live " hedges, have been listed in India. Those that are known, usually have a limited local application, and few will thrive in *barani* areas, particularly in those of low rainfall. Much time must, therefore, elapse before suitable " live " hedges to cover the wide extremes of soil and climate met with in India, are discovered. Even then the science of maintaining them (hedging) will have to be worked out for the various types, and the information distributed. Live hedges, therefore, do not meet the present urgent problem.

(ii) " *Dead fences* " depend on an adequate local supply of thorny plants, to build the fences and afterwards repair and maintain them. To be cattle-proof, they must be high and thick, which means a wide base covering, and rendering useless, a considerable area of valuable land. They are easily damaged by dust storms and gales, are very vulnerable to fire, and form a refuge for many crop and animal pests. Expenditure on maintenance is continuous.

(iii) *Wire fencing*, is very expensive, and quite beyond the means of the average peasant. Its proper erection is skilled work, and it must be continually patrolled and repaired. Very few people have any conscience if a piece of wire is required and a wire fence is handy.

(iv) *Walls.*—Walls may be divided into two classes :—

(*a*) *pucca* masonry walls of baked bricks,

(*b*) *kacha* walls of sun-dried bricks.

The first depends on the existence of a kiln adjacent to the site, and the second on a supply of suitable earth, and a sufficient water supply readily to hand.

Both are expensive [although the original cost of (*b*) is less than that of a (*a*)], and both require skilled and semi-skilled artisans for their erection.

The maintenance costs of both are fairly high, and *kacha* walls lose on their cheaper original cost, by being more expensive to maintain.

The ideal methods of enclosure must be found in something which can be erected cheaply, by local unskilled labour, from materials available at site. It must be permanent, occupy as little land as possible, and be cheap to maintain and repair.

A solution of this problem may perhaps be found in *pise-de-terre* (rammed earth), which from work in progress at the Government Cattle Farm, Hissar, appears to fill all of the above mentioned requirements. A full description is being published shortly in the ' Agriculture and Live stock in India '. The following extracts will suffice for the present purpose.

Extracts from an aritcle in ' Pise de Terre ' by W. S. Read, P. V. S., Superintendent, Government Cattle Farm, Hissar.

* * * * * * * * *

2. *Pise de terre* (rammed earth) must on no account be confused with the sun-dried brick, and mud-walling operations, carried on in many parts of this country. Advocates of *pise de terre* have the greatest difficulty in convincing the uninitiated that this type of construction is different from, and much stronger and more permanent than sun-dried brick or mud walls. Mud (wet soft earth) has no place in *pise de terre* practice.

3. Building construction in *pise de terre* is no new or modern invention. It has stood the test of time. Pliny mentions it in his " Natural History ". The Romans introduced it into France, and buildings of *pise de terre* have been erected in England, Africa, Australia, New Zealand, Mexico and California representing a very wide range of climatic variation. Even in India *pise de terre* is not unknown, as work of this description was carried out at Etah Gaol in 1867-68. Never-the-less, although building in *pise de terre* has been practiced for so many centuries in so many widely spread countries, the process is still unknown to the mass of the general public.

* * * * * * *

4. The whole process of *pise de terre* building construction can be condensed into a few words. It consists of erecting parallel wooden shutters on the site of the wall to be erected. The distance between these parallel shutters being the width of the wall required. A layer of fine earth (not mud) some four to five inches deep is spread evenly between the shutters. This earth is well rammed with wooden rammers, until they fail to leave an impression upon it. Similar layers of earth are spread and rammed until the top of the shuttering is reached. The shutters are immediately dismantled and set up for the next section. The full height of the wall is reached by placing the shutters on the courses of the wall already completed. Several sets of shutters may be in use at the same time, for as soon as two sections of the first course are finished the second course can be commenced. When two sections of the second course are ready the third course can be commenced and so on. The work thus progresses in a series of steps, which eliminates the necessity for ladders or scaffolding.

* * * * * * *

The walls should be allowed to dry out for about 15 days before they are finished off with plaster. Ordinary *lopai* plaster, such as is used for *kacha* walls will do, and a coating of coal tar will render it impervious to the weather.

The most vulnerable part of these walls is the top, which should be well-finished off. Driving rain has little effect on the sides of the walls if they are properly plastered, but water percolating through the top of the wall can do a lot of damage.

If desired, the top of the wall can be finished off with a few courses of burnt bricks in lime, which should include a drip course.

Should something cheaper be desired, round off the top of the wall with mud and plaster it, gibing a final coat of tarcoal if ordinary country plaster is used.

Conclusion.

6. Walls of this description can be made for about Rs. 1,200 a mile, entirely by unskilled labour, supervised by an ordinary mason to use the plumb line to keep the moulds upright. This estimate includes the cost of maintenance of a pair of bullocks to plough and cart the soil and also cart water to the site. This shows a tremendous saving on Public Works Department estimates for brick walls which work out as follows :—

(*a*) Burnt brick in mud with cement pointing Rs. 10,560 per mile.

(*b*) Burnt brick in mud, but without cement pointing Rs. 7,920 per mile.

(*c*) Sun-dried bricks in mud with $7\frac{1}{2}''$ top course of *pucca* burnt brick Rs. 3,630 per mile.

The most important point, which is really the whole secret of *pise de terre* building is good ramming. If soil of the right consistency is used, in shallow layers as described, and the ramming is well and truly done, very durable walls and buildings can be made.

Should cracks appear in the blocks a few days after they are finished, it is a sure sign that the percentage of clay in the soil is too high, and should be reduced by blending.

I have been asked whether white ants will damage these walls. I can only say that over ten years ago about fifty feet of wall, with no foundation, was built here. It has remained totally exposed to the weather ever-since and irrigation water often flows right up to its base. There is no sign at all of the presence of white ants. A few weeks ago a small section was cut out (after considerable heavy labour with pick-axes) and the interior of the wall was found to be almost as hard and solid as rock, with no signs of white ants, or other damage.

SUPPLEMENTARY NOTE ON SUBJECT NO. 13.

NEED FOR INVESTIGATION OF THE PROTEINS OF INDIAN GRASSES.

(*Submitted by the University Bio-chemical Laboratory, Madras.*)

The biological value of proteins depends in animal as in human nutrition on the presence of indispensable amino-acids. Apart from the need for maintenance and growth which are considered in assessing the value of human dietaries, in animal nutrition the amino-acids essential for milk production have also to be taken into account. According to Fowler, Morris and Wright (*The Scottish Journal of Agriculture*, Volume XVII, 1934) for the ruminant the essential amino-acids are lysine, tryptophane, arginine and histidine. The needs for lactation have been the subject of much special study recently in the Hannah Dairy Research Institute by Wright and co-workers (*The Journal of Dairy Research*, 1933, *4*, *177*; *ibid*, *5*, 1; and *ibid*, 1936, *7*, 97) and the interesting conclusion has been reached that with the usual rations in Great Britain lysine is the limiting factor in milk-production. The amino-acid content of feeding stuffs used in America has been determined by many experiments notably Mitchell and Hamilton (1929) who gives the values for about 30 feeds. Other well-known recorded values for America are : (H. S. Grindly, W. E. Joseph, and M. E. Later, *J. Am. Chem. Soc.*, 37, 1778-1781, 1915 ; *ibid*, 37, 2762-2769, 1915 ; E. H. Nollau—*J. Biol. Chem.*, 21, 611-614, 1915). The determinations of the amino-acids of various feeds carried out at the Hannah Dairy Research Institute have been published by Morris (*The Journal of Dairy Research*, *5*, 108-112, 1934).

The grass proteins are being made the subject of a thorough investigation in England by Prof. A. C. Chibnall *et al* in connection with the experiments in intensive grass-land cultivation carried out by the Imperial Chemical Industries Research Station at Jealotts Hill (*Biochem. J.*, *26*, 392, 1932 ; *ibid 27*, 1879, 1933).

It would be useful to carry out similar investigations on Indian grasses especially as a preliminary to the improvement of grass-land by the breeding of pure strains of grasses or the application of mineral nitrogenous fertilizers.

NOTE ON SUBJECT No. 14 (*a*).

FODDER PRODUCTION WITH SPECIAL REFERENCE TO MIXED FARMING AT THE GOVERNMENT FARM, BICHPURI (AGRA).

By

M. S. JUNG,

Deputy Director of Agriculture, United Provinces.

Situation and Suitability.—The Bichpuri farm is situated on the Agra-Bharatpur road about 7 miles from Agra city and a mile from the Bichpuri railway station. Both from its nearness to the railway station and to the city this farm is particularly suited for mixed farming. It is irrigated by the Lower Jumna Canal which passes along the eastern boundary of the farm.

Object of the Experiment.—The experiment was laid down with the object of proving that mixed farming made possible not only a higher intensity of cultivation but resulted in greater profit from crops and milch cattle.

Description of the Experiment.—In April 1937, eight she-buffaloes and a bull were kept on the farm. Later in the year the total number was brought to 14 she-buffaloes and one bull. In Statement III (A) is giving a cropping scheme with fixed rotation such as is now to be adopted on the farm under the experiment. This provides the necessary fodder both green and dry to feed a breed of 16 milch buffaloes and one bull in addition to 9 pairs of draught cattle used in the ordinary course. Statements No. VIII and IX indicate the quantity of green and dry fodder made available and the strength of cattle maintained, namely 8,425 maunds of green fodder equivalent to 2,808 maunds of dry fodder which with 1,438 maunds of edible crop residues provides a total dry fodder equivalent to 4,246 maunds. The total requirement of bulky fodders including allowance for young stock is 4,068 maunds. There is thus an estimated surplus of fodder of 178 maunds disregarding the probability that the outturn of fodder crops will improve as the fertility of the farm increases with higher standard of manuring.

Statement No. III (B) (not enclosed) shows the intensity of irrigation both of Kharif and Rabi crops. In the former it is 52% and in Rabi 64%. These figures are based on the experiments in a normal season. The percentages are somewhat higher than those to be found on cultivator's fields, but any one undertaking mixed farming on the scale adopted at Bichpuri would have to make provision for such a degree of intensity of irrigation. In statements Nos. IV to VII are given the estimates of cost of cultivation of crops and the income therefrom during

(*a*) the premixed farming period and

(*b*) the post mixed farming stage.

From these experiments has been worked out a tentative balance sheet in statement No. XII showing the expectation of financial results during the next 3 or 4 years as against those obtained during the period immediately prior to the experiment.

Results so far obtained.—It is too early yet to discuss the results obtained so far for the following reasons :—

(1) During 1937-38 the total precipitation was 13″. Similarly during 1938-39 the total rainfall was 18″ as against 25″ which is the average for the district. During both these years, therefore, the deficit in the rainfall caused a high intensity of irrigation to be practised and resulted not only in extra expenses but unsatisfactory crop returns. As against these two years, the rainfall in the year 1936-37 immediately prior to the commencement of the experiment was 34″.

(2) The effect upon the soil fertility and consequent yield as well as upon the finance of the farm from maintaining a large number of cattle, especially milch buffaloes, cannot be assessed on the results of less than two years working specially when there was no great deficiency in the rainfall. A Statement No. IX-B shows the increased quantity of manure which is now being prepared as against the quantities available before mixed farming experiment.

Taking the actual crop yield figures as given in Statement I (not enclosed) there was an improvement in the yields of crop in 8 cases notwithstanding these adverse conditions. Similarly from Statement II (not enclosed) it will appear that the milk-yield of the buffaloes has improved during the last three years in 8 cases.

Conclusions.—In Statements Nos. XII and XIII are given the estimates of expectations of results during the next 3 or 4 years against the financial results obtained prior to the commencement of the experiment. A gross profit is anticipated of Rs. 2,168 under mixed farming as compared with a profit of Rs. 1,442 prior to its introduction. Statement XII is based on crop yields obtained prior to the experiment and not such as may be expected as a result of additional heavy manuring due to the presence of a large number of cattle. In short, the estimates are conservative and give (1) normal years of rainfall, (2) an intensity of cultivation of about 52% *Kharif* and 64% *Rabi* and (3) the fixed rotations and cropping schemes as laid down in Statement III, the indications are that the experiment will prove that mixed farming is considerably more profitable than ordinary arable farming under irrigated conditions.

STATEMENT I.

STATEMENT I.

Statement of crop yields per acre showing comparison between pre-mixed farmiug and post-mixed farming at Bichhpuri Government Farm, District Agra.

Serial No.	Name of crops.	Under pre-mixed farming.										Under post mixed farming.						Remarks.
		1934-35 yield per acre in mds.		1935-36 yield per acre in mds.		1936-37 yield per acre in mds.		1937-38 *Kharif* only.		Average yield per acre in mds.		1937-38 *Rabi* only.		1938-39 yield per acre in mds.		Average yield per acre in mds.		
		Grain or *kapas*.	Straw.	Grain. or *kapas*.	Straw.	Grain or *kapas*.	Straw.	Grain or *kapas*.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	
	Kharif Crops.																	
1	Cotton (*kapas*) ..	5	..	12	..	7	..	11	..	8·75	..	..	..	12	..	12	..	
2	Sugarcane (plant cane)	644	..	645	..	920	..	543	..	688	..	..	..	700	..	700	..	
3	Sugarcane ratoon ..	..	..	..	..	527	..	322		424·5	..	..	..	..	..	..	..	Not grown in 1938-39.
4	Chari (Juar)	..	323	..	208	..	211	..	93	..	208·7	..	..	..	203	..	203	Not much difference.
5	Guar for grain ..	3	..	18	..	..	..	7	..	9·3	..	..	..	9·3	..	9·3	..	Equal.
6	Guar for green fodder ..	..	173	..	190	..	139	..	44	..	136·5	..	..	..	137·2	..	137·2	
7	Juar for grain ..	7	92	6	93	14	101	14	90	10·2	94	..	..	4	72	4	72	
8	Bajra for grain ..	..	..	8	45	10	68	10	64	9·3	59	..	..	14	60	14	60	
9	Soya bean	..	..	..	..	2	..	4	..	3	..	..	..	9	..	9	..	
	Rabi crops.																	
10	Potato	..	..	41	..	..	..	..	..	41	..	113	..	..	..	113	..	
11	Linseed	11	..	10	..	7	..	.	..	1·3	..	3	..	10	..	6·5	..	
12	Wheat	21	50	27	41	27	39	..	..	2·5	43	15	31	25	45	20	38	Wheat in 1937-38 was grown after chari, hence low yields.

13	Wheat Experiment ..	13	34	12	28	13	16	..	..	12·6	26	20	40	22	41	21	40·5		
14	Barley	30	41	..	..	..	..	..	..	30	41	9	9	..	..	9	9	Barley in 1937-38 was grown late after chari, hence so poor yields.	
15	Barley Experiment ..	34	41	33	32	35	37	..	..	34	38	34	44	32	42	33	43	Not much difference.	
16	Berseem	..	446	..	..	..	119	..	..	..	282	..	276	..	350	..	313		
	N.B.—Total rainfall ..	22·40		20·25		34″		13″						18″					

STATEMENT II.

Statement of milk yield per cattle showing comparison of different years.

Serial No.	Brand No. of Buffalo.	Pre-mixed farming.		Mixed farming, 1937-38 in lb.	Remarks.
		1935-36 in lb.	1936-37 in lb.		
1	26/E.-62	6,350	4,948	5,213	
2	41/E.-93	..	3,613	5,444	
3	38/E.-86	1,426	4,478	4,334	
4	34/E.-75	2,973	4,561	6,010	
5	37/E.-84	4,199	3,593	3,773	
6	91/E.-103	4,970	3,851	4,702	
7	112/E.-5	..	3,009	5,062	
8	103/E.-17	..	5,429	4,787	
9	10/E.-83	2,250	3,489	3,459	
10	83/E.-91	3,208	3,494	3,711	
11	114/E.-7	—	..	3,299	
12	85/E.-98	1,543	4,025	4,110	

STATEMENT III-A.

STATEMENT III-A.

Cropping scheme as proposed for mixed farming to be practised at Government Farm, Bichpuri, District Agra.

Area in acres.	1939-40. Kharif.	1939-40. Rabi.	1940-41. Kharif.	1940-41. Rabi.	1941-42. Kharif.	1941-42. Rabi.	1942-43. Kharif.	1942-43. Rabi.
9	Cotton ..	..	Sugarcane ..	Sugarcane ..	Ratoon ..	Ratoon ..	Guar and cow peas.	Wheat ..
9	Sugarcane ..	Sugarcane ..	Ratoon ..	Ratoon ..	Guar and cow peas.	Wheat ..	Cotton ..	..
9	Ratoon ..	Ratoon ..	Guar and cow peas.	Wheat ..	Cotton ..	..	Sugarcane ..	Sugarcane ..
9	Gaur and cow peas.	Wheat ..	Cotton ..	..	Sugarcane ..	Sugarcane ..	Ratoon ..	Ratoon ..
4	Chari ..	Gram ..	Cotton ..	Peas ..	Juar and late arhar.	..	..	..
4	II Cotton ..	Peas ..	Juar and late arhar.	..	Chari ..	Gram ..	..	..
4	Juar and late arhar.	..	Chari ..	Gram ..	Cotton ..	Peas ..	..	..
3	Chari ..	Gram ..	Soya bean for grain.	Barley ..	Bajra ..	Berseem ..	..	..
3	III Soya bean ..	Barley ..	Bajra ..	Berseem ..	Chari ..	Gram ..	..	..
3	Bajra ..	Berseem ..	Chari ..	Gram ..	Soya bean ..	Barley ..	..	..

Abstract as per proposed cropping scheme.	
Kharif crops—	
(1) cotton	= 13
(2) Sugarcane	= 9
(3) Sugarcane ratoon.	= 9
(4) Guar and cow peas.	= 9
(5) Early maize cow peas. and moth.	= 6
(6) Chari	= 13
(7) Juar and late arhar.	= 4
(8) Bajra for seed	= 3
(9) Early arhar	= 3
(10) Soya bean	= 3
Total	= 72

3	Chari ..	Linseed ..	Early arhar ..		Early maize and moth for green fodder.	Wheat	..	..
3	IV Early arhar ..	..	Early maize and moth.	Wheat ..	Chari ..	Linseed	..	..
3	Early maize and moth.	Wheat ..	Chari ..	Linseed ..	Early arhar	.. ..	..	..
3	Chari ..	Mustard = 2 ac. Tobacco = 1 ac.	Early maize and cow peas.	Berseem ..	Fallow or green manuring.	Wheat	..	..
3	V Early maize and cow peas.	Berseem ..	Fallow or green manuring.	Wheat ..	Chari ..	Mustard = 2 ac. Tobacco = 1 ac. ..	..	..
3	Fallow or green manuring.	Wheat ..	Chari ..	Mustard = 2 ac. Tobacco = 1 ac.	Early maize and cow peas.	Berseem	..	..
3	Under experiment.		Under experiment.		Under experiment.	..	..	
3	Lucerne and Napier. etc.		Lucerne and Napier, etc.		Lucerne and Napier, etc.	..	..	
	Orchard.		Orchard.		Orchard.	..	..	
— 7	Total area under cultivation = 88.							

Rabi Crops—

(11) Wheat	=	15
(12) Gram	=	7
(13) Peas	=	4
(14) Barley	=	3
(15) Berseem	=	6
(16) Linseed	=	3
(17) Mustard	=	2
(18) Tobacco	=	1

Total	41
Under experiment	3
Lucerne, etc.	3
Orchard	7
Total	13
Grand Total	126 acres.

STATEMENT III-B.

Statement showing the intensity of irrigation in Kharif *and* Rabi *under the proposed cropping scheme of post mixed farming.*

Crops.	Irrigated area.	Non-irrigated area.	Remarks indicating the percentage of irrigation.
Kharif—			
1. Cotton	13	..	
2. Sugarcane	9	..	
3. Sugarcane Ratoon	9	..	
4. Guar and Cow peas	..	9	
5. Early maize and cow peas ..	6	..	
6. Chari	6	7	
7. Juar and late arhar	..	4	
8. Bajra for seed	..	3	
9. Early arhar	..	3	
10. Soya bean	3	..	
Total ..	46	26	52 % of the total cultivated area of the farm.
Rabi—			
11. Wheat	15	..	
12. Gram	..	7	
13. Peas	4	..	
14. Barley	3	..	
15. Berseem	6	..	
16. Linseed	3	..	
17. Mustard	2	..	
18. Tobacco	1	..	
19. Experiments	3	..	
20. Lucerne	3	..	
21. Orchard	7	..	
	47	7	
22. Sugarcane	9	..	
	56	7	64% of the total cultivated area of the farm.

STATEMENT IV.

Statement showing the cost of cultivation of the crops grown prior to the experiment of mixed farming at Govrnment Farm, Bichpuri.

Name of crops.	Average area under crops.	Average cost of cultivation per acre.	Total amount of expenditure.	Remarks.
1. Sugarcane	23·2	117	2,714	
2. Cotton	14·2	37	529	
3. Guar for fodder	4·5	10	45	
4. Chari	9·3	16	149	
5. Late arhar	1·0	30	30	
6. Juar Experiment	·3	55	17	
7. Bajra Experiment	·6	35	21	
8. Soya bean	·3	35	11	
9. Guar for grain	1·0	20	20	
10. Juar for grain	1·0	35	35	
11. Castor	·6	30	18	
12. Groundnuts	·6	60	36	
13. Lucerne	1·0	40	40	
14. Peas	16·3	27	440	
15. Wheat	13·0	67	871	
16. Barley	4·6	67	308	
17. Gram	8·0	22	176	
18. Linseed	3·0	48	144	
19. Tobacco	·3	50	15	
20. Berseem	2·0	38	76	
21. Potato	·3	100	30	
22. Orchard	1·6	200	320	
	106·8		6,045	

STATEMENT V.

Statement showing the cost of cultivation of the crops proposed to be grown during the experiment of mixed farming at Government Farm, Bichpuri, District Agra.

Name of crops.	Area under crops.	Average cost of cultivation per acre.	Total amount of expenditure.	Remarks.
1. Cotton	13	37	481	
2. Sugarcane including ratoons	18	117	2,106	
3. Guar and cow peas	9	10	90	
4. Early maize, cow peas and moth	6	10	60	
5. Chari	13	16	208	
6. Juar and late arhar	4	35	140	
7. Bajra	3	35	105	
8. Early arhar	3	30	90	
9. Soya bean	3	35	105	
10. Wheat	15	67	1,005	
11. Gram	7	22	154	
12. Peas	4	27	108	
13. Barley	3	67	201	
14. Berseem	6	35	210	
15. Linseed	3	48	144	
16. Mustard	2	30	60	
17. Tobacco	1	50	50	
18. Experimental crops	3	60	180	
19. Lucerne	3	40	120	
20. Orchard	7	200	1,400	
Total ..	126		7,035	

STATETMENT VI.

Statement showing the value of crops prior to the experiment of mixed farming at Government Farm, Bichpuri, District Agra.

Name of crops.	Average acres.	Average yield per acre.		Value of grain.			Value of straws.			Total amount.
		Grain.	Straws.	Quantity.	Rate.	Amount.	Quantity.	Rate.	Amount.	
Kharif Crops.					Rs. A.	Rs. A.	Rs. A.	Rs. A.		
1. Cotton	14·3	8	..	114	5 0	570	..	..	..	570
2. Sugarcane ..	23·2	631	..	14,639	0 5	4,575	..	..	..	4,575
3. Sugarcane ratoon ..										
4. Guar for fodder ..	4·5	..	167	..	..	..	751	0 2	94	94
5. Chari	9·3	..	247	..	..	..	2,292	0 2	286	286
6. Late arhar ..	1	9	9	9	3 0	27	9	0 6	4	31
7. Juar experiment ..	·3	9	95	3	2 8	8	32	0 4	8	16
8. Bajra experiment ..	·6	9	56	6	2 8	15	34	0 4	8	23
9. Soya bean ..	·3	3	6	1	4 0	4	2	0 6	1	5
10. Guar for seed ..	1	10·5	8	10·5	2 8	26	8	0 6	3	29
11. Juar for grain ..	1	9	95	9	2 8	23	95	0 4	24	57
12. Castor	·6	6·5	..	4	3 8	14	..	..	..	14
13. Groundnut ..	·6	18	..	11	3 0	33	..	..	..	33
Rabi Crops.										
14. Peas	16·3	9·6	9	156	2 0	312	147	0 6	55	367
15. Wheat	13	19	35	247	3 0	741	655	0 8	227	968
16. Barley	4·6	32	40	147	2 4	331	184	0 8	92	423
17. Gram	8	17	13	136	2 8	340	104	0 8	52	392
18. Linseeds ..	3	9·3	..	28	4 0	112	..	..	..	112
19. Tobacco	·3	9	..	3	6 0	18	..	..	..	18
20. Berseem	2	..	282	..	..	..	564	0 2	70	70
21. Lucerne	1	..	333	..	..	..	333	0 2	42	42
22. Potato	·3	41	..	12	1 8	18	..	..	..	18
23. Orchard	1·6	..	..	..	200	320	..	..	..	320
	106·8					7,487			966	8,453

STATEMENT VII.

Statement showing the value of crops as proposed in the cropping scheme of post-mixed farming at Government Farm, Bichpuri, District Agra.

Name of crops.	Area in acres.	Average yield per acre.		Value of grain.			Value of straw.			Total amount.
		Grain.	Straw.	Quantity.	Rate.	Amount.	Quantity.	Rate.	Amount.	
		Mds.	Mds.		Rs. A.	Rs.		Rs. A.	Rs.	Rs.
Kharif Crops.										
1, Cotton	13	8	..	104	5 0	520	..	..	..	520
2. Sugarcane	9	631	..	11,358	0 5	3,549	..	..	..	3,549
3. Sugarcane Ratoon ..	9									
4. Guar and cow peas ..	9	..	167	..	..	..	1,503	0 2	188	188
5. Early maize cow peas and moth	6	..	170	..	..	..	1,020	0 2	127	127
6. Chari	13	..	247	..	..	..	3,211	0 2	401	401
7. Juar and late arhar	4	15	90	60	2 8	150	360	0 4	90	240
8. Bajra	3	9	56	27	2 8	68	168	0 4	42	110
9. Early arhar ..	3	12	12	36	2 8	90	36	0 6	14	104
10. Soya bean ..	3	8	10	24	4 0	96	30	0 6	11	107
Rabi Crops.										
11. Wheat	15	19	35	285	3 0	855	525	0 8	262	1,117
12. Gram	7	17	13	119	2 8	297	91	0 8	45	342
13. Pea	4	10	9	40	2 0	80	36	0 6	13	93
14. Barley	3	32	40	46	2 4	216	120	0 8	60	276
15. Berseem	6	..	282	..	..	..	1,692	0 2	211	211
16. Linseed	3	9	..	27	4 0	108	..	..	..	108
17. Mustard	2	10	..	20	4 0	80	..	..	..	80
18. Tobacco	1	9	..	9	6 0	54	..	..	..	54
19. Experimental crops	3	..	..	..	..	90	..	..	36	126
20. Lucerne	3	..	333	..	..	..	999	0 2	125	125
21. Orchard	7	..	..	..	..	1,400	..	..	..	1,400
	126					7,652			1,625	9,278

STATEMENT VIII.

Statement showing the quantities of fodder to be produced under the proposed cropping scheme of mixed farming.

——	Area in acres.	Average outturn per acre.	Total quantity of Green fodder.	Total quantity of dry fodder.	Remarks.
		Mds.	Mds.		
1. Guar and cow peas	9	167	1,503	..	
2. Early maize, cow peas moth	6	170	1,020	..	
3. Chari	13	247	3,211	..	
4. Juar and late arhar	4	90	..	360	
5. Bajra	3	56	..	168	
6. Early Arhar	3	12	..	36	
7. Soya bean	3	10	..	30	
8. Wheat	15	35	..	525	
9. Gram	7	13	..	91	
10. Pea	4	9	..	36	
11. Barley	3	40	..	120	
12. Berseem	6	282	1,692	..	
13. Experimental crops	3	..	..	72	
14. Lucerne	3	333	999	..	
Total	..	..	8,425	1,438	

N.B.—8,425 maunds of green, when converted in terms of dry fodder it would come to 2,808.

Total quantity of dry fodder available=4,246.

STATEMENT IX.

Statement showing the strength of cattle and their fodder requirements in terms of dry fodder for one year.

No. of heads.	Fodder requirements per head per day.	Total requirements of fodder for a year.	
	Seers.	Mds.	
1. 18 draught cattle	10	1,620	
2. 16 milch-buffaloes	16	2,448	Ration includes the allowance for young calves.
3. 1 breeding bull			
Total		4,068	

N.B.—Total requirements of bulky fodder come to 4,068 mds.

Total quantities of available fodder are 4,246 mds.

Hence there will be some surplus of 178 mds. That is to say that the supplies of fodder should prove quite enough under mixed farming when outturns of fodder crops will be on improvement side with better manuring.

STATEMENT IX-B.

Statement of the quantity of manure wihch is being prepared under mixed farming as against the quantities obtained before mixed farming :—

Manure obtained during pre-mixed farming period under compost method.		Additional quantity of manure obtained from the dairy herd under compost method.		Total quantity of manure obtained during post mixed farming period in Mds.	Remarks.
No. of cattle dealt with.	Quantity of manure got in Mds.	No. of dairy cattle dealt with.	Quantity of manure got in Mds.		
18 draught cattle ..	225 × 18 4,050 Mds.	17 dairy cattle.	300 × 17 5,1000 Mds.	9,150 Mds.	Buffaloes turnout more drug than bullocks.

STATEMENT X.

Additional recurring expenditure on account of labour and concentrate required for the maintenance of milch cattle.

(1) Labour—

	Rs.
2 milkmen @ Rs. 12 per month	288
2 Herdmen @ Rs. 10 per month	240
Total ..	528

(2) Concentrates—

for 16 milch buffaloes and one murrah bull @ an average of 3 seers per head per day 17 × 3 × 30 × 12 = 459 maunds @ Rs. 2-8-0 per maund	1,147
Grand Total ..	1,675

Statement XI.

Total receipts expected from the unit of dairy herd to be kept at Government Farm, Bichpuri.

Income :—

Out of a herd of 6 buffaloes, 10 will be in milk on an average throughout the year, the yield of milk from 10 buffaloes @ an average milk yield of 8 seers per head will be :—

$$\frac{10 \times 8 \times 365}{40} = 730 \text{ maunds.}$$

	Rs.
Value of 730 mds. of milk @ Rs. 3-8 0 per maund ..	2,555
Value of 240 cart loads of manure manufactured ..	240
	2,795

Statement XII.

Statement of expenditure and income of mixed farming of Government Farm, Bichpuri.

Particulars of expenditure.	Amount.	Particulars of income	Amount.
1. Cost of cultivation including all charges as per Statement V.	7,035	1. Value of cash and grain crops as per Statement VII ..	7,653
2. Additional cost of labour and concentrate of the dairy hand as per Statement X	1,675	2. Price of milk of dairy herd as per Statement XI	2,555
3. Depreciation on milch cattle @ 10%	170	3. Value of manure obtained from dairy herd as per Statement XI.	240
	8,880	4. Value of 16 calves raised during the years as below :—	
		8 calves @ 50 each = 400.	
		4 „ „ 30 each = 120.	
		4 „ „ 20 each = 80.	
		690	600
4. Gross profit	2,168	.. ..	
Total ..	11,048		11,048

STATEMENT XIII.

Statement of expenditure and income of the pre-mixed farming at Government Farm, Bichpuri.

Expenditure.		Income.	
Particulars.	Amount.	Particulars.	Amount.
1. Cost of cultivation of crops including all charges as per Statement IV	6,045	1. Value of cash and grain crops as per Satement VI ..	7,487
2. Gross profit	1,442		
	7,487		7,487

SUPPLEMENTARY NOTE ON SUBJECT No. 14 (*a*).

IMPLICATIONS OF HAY MAKING

BY

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An important aspect of nutritional investigation in animal husbandry is the application of the best possible practices in fodder and hay conservation. In most parts of the world there is great economic loss through failure to harvest and conserve fodder plants effectively. India has its very wet and very dry seasons. Grasses and fodder plants which are in abundance in the rainy season, are rather scarce during the dry parts of the year. Since roughage must be supplied to the animals all through the year for maintaining their physiological integrity, the green fodder in times of plenty must be converted into a form in which it can be stored against a lean period to avoid wastage of herbage, which cannot be consumed before decomposition commences and a bulky food prepared containing as much of the nutrient properties of the original crop as possible.

The criteria for determining the nutritive value of a roughage is based by Roberts [1937] on :—

(1) The carotene (precursor of vitamin A) content.

(2) The crude protein content.

(3) The crude fibre content.

Probably we might add the mineral contents, and total dry matter, etc., to the above list besides palatability, aroma and colour.

In this note we will only consider how carotene is affected, if at all, in the process of hay making as is ordinarily practised by the average farmer, for it is considered to be one of the most important constituents from the animal nutrition point of view and is likely to undergo changes.

The significance of providing an adequate supply of carotene to men and animals will be appreciated when we consider that since the early experiments of McCollum and Davis [1913] and Osborn and Mendel [1913 and 1914] on fat soluble vitamins, night blindness and xerophthalmia are ascribed to a vitaminosis-A. Mellanby [1934] suggested that vitamin-A deficiency is probably an important factor in conditions like pellagra, lathyrism and convulsive ergotism. Besides this avitaminosis-A has been reported to cause paralysis in swine [Dunlop, 1934] and in cattle and horses [Edward, 1937]. Guilbert and Hart [1935] observed degenerative changes in the kidneys of cattle and absence of sperms from the testes of a bull that died of avitaminosis-A. MacGregor [1936] remarked that deficiency of vitamin-A may be associated with heat stroke, Kumri and non-sweating in horses.

Evidence obtained from the various reports received from different parts of India is accumulating to show that such clinical manifestations, besides

congenital blindness are of common occurrence in farm animals especially during draught periods or when they are fed on wheat, barley or oat straw or poor hay, for a major portion of the year, and it may be pointed out that grasses and hays are among the chief sources of carotene for farm animals as the concentrates are invariably poor in carotene, and besides, the vast majority of animals in India are, in actual practice, not provided with grain. As the feeding of the domestic animals in the best possible manner is one of the most important economic problems in animal husbandry in an agricultural country, where the cattle form the most valuable asset of about 80 per cent of the population, the paramount importance of providing a continuous supply of a good quality of hay can hardly be under-estimated.

A considerable number of samples of hay received from different parts of India were found to be very poor in carotene. Experiments on the green grasses and other fodder plants, however, obtained locally, and some of the samples of hay received from outside showed that they were fairly rich in carotene. One is, therefore, led to consider whether the present methods of conserving hay as practised by the average cultivator cause, in any way, the destruction of carotene. Variations were also observed in the amount of carotene of different species of fodder plants at different stages of growth. McCollum [personal communication, 1937] suggested that variations in the carotene contents of hay and fodder plants may be due not only to the difference in the species of the plants from which hay is produced, but also to the maturity of the plants at the time of harvesting and to the different methods used in conserving them. Samples of fresh jowar (*Sorghum vulgare*) were obtained from the Mukteswar Institute Farm at a time when they are usually harvested for hay making. The samples were immediately transported to the laboratory and were dried in the following manner :—

Sample 1.—Dried in direct sun (not allowed to be leached by rain).

Sample 2.—Dried in direct sun (exposed to rainfall as well).

Sample 3.—Dried in diffused sunlight (under a tree).

When these samples were dry, they were cut into smaller pieces to facilitate saponification and examined for their carotene contents by Ferguson and Bishop's [1937] method. In each case carotene contents of the fresh samples were determined as a control measure immediately on arrival in the laboratory.

It was interesting to observe that the carotene contents of the sample dried in direct sunlight decreased from 50 to 75 per cent compared to the fresh samples. The samples placed under the tree and those exposed to the rain during the course of drying also showed a similar effect on the carotene content. These observations were made during the months of September, October and November, when the temperature in the shade, as recorded by the local Observatory, ranged from 48° to 78° in September ; from 40° to 75° in October and from 30° to 60°F. in November. The difference between the maximum temperature in the shade and in the sun varied from 15°F. to 20°F.

It was further intended to ascertain how soon the carotene is destroyed when exposed to direct sunlight. The results are given in the following table ;

Period of exposure to sunlight in hours.	Carotene in mg. per 100 grm. dry weight.
Control (Fresh sample of Jawar)	36·06
2 hours	33·01
4½ hours	31·24
9 hours	16·76
13½ hours	8·74
17¾ hours	4·50

These observations indicate that when hay is made in the sun, a major portion of the carotene content of the Jawar plant is destroyed. It appears that in the light of these findings we shall have to look with suspicion upon the time-honoured saying " Make hay while the sun shines ".

In addition to the above, carotene estimations were made of the whole plant as well as of the different parts of the plant. It is obvious from the results given in the following table that the leaves are the richest source of carotene, whereas the stem is the poorest.

Parts of the plant.	Carotene mg. per 100 grm. dry matter.
Control (whole plant except roots)	36·06
Leaves	68·87
Corn	9·53
Stem	0·21

It may be pointed out that owing to overdrying and allowing the fodder crops to remain too long in the fields after harvesting due occasionally to the pre-occupation of cultivators and during transport and stacking, a considerable amount of leaves which are the richest source of carotene are broken off. Woodman and Norman [1928] estimated the losses through breaking of leaves, washing of the constituents by rain and fermentation in stacks, etc., to an average of about 25 per cent for the whole of Great Britain. Whatson [1935], however, considers that the loss of nutrients ranges from 33·1 to 48·0 per cent. The above workers did not, however, take into consideration the significant loss in the amount of carotene. If, therefore, this factor is also included, the aggregate losses can be put at a much higher figure.

This important but complicated problem is now being attacked from two points of view :—

(1) To elucidate by scientific methods, the factor or factors that play an important role in the destruction of carotene and how carotene destruction is brought about. In this connection work is in progress to investigate the effect of heat (oven at 100°, 75° and 37°C.) ; heat and moisture (autoclave) ultra violet light, refrigeration and enzymes, etc., etc.

(2) To find out a practical alternative method suitable for Indian conditions for conserving fodder plants, so that the original nutrient properties of the plant are not affected and involves the least extra expense to the cultivator, if any.

In elaborating this aspect of the problem, attempts are being made to find out the best stage in the growth of the plant which is most suitable for harvesting so that the farmer can derive the best benefit out of his crop, siloing the fodder plants at different stages of their growth and examining the plants for the variations in their compounds at different intervals trying different types of pits and other methods of conservation, etc., etc. Al hough observations made so far at this Institute and at other places indicate that the best time for harvesting grass for hay making is after flowering but before the seed has commenced to mature, it is unfortunately not possible to harvest grass in this manner in the country like India, as pointed out by Col. Mellor (1933), on a large scale, because of the pre-occupation of the cultivators during that period.

It is therefore, obvious from the considerations briefly outlined above, how complicated are the implications of hay-making and that there is no doubt that hay-making, more than any other farm operation offers a problem for immediate solution and the country badly needs exact knowledge on the subject.

NOTE ON SUBJECT NO. 14 (*b*).

THREE FODDERS WITH SPECIAL REFERENCE TO FLOODED AREAS.

I

Note submitted by the Government of Orissa.

There is great scarcity of fodder in the flooded areas during the monsoons. When the rivers are in spate the cultivated areas intermittently and for fairly long stretches at a time, go under water. The cattle population of entire villages then have to depend for their existence on what little vegetation they can find on the village high lands. The situation becomes still more acute due to the fact that there is no stall feeding which makes the matter more serious and no fodder is grown as a crop.

To solve this problem it is necessary to have suitable source of fodder throughout the year and this may be arranged (1) by growing the same in suitable season and preserving it either as hay or as silo or (2) by growing suitable trees of which the leaves may be fed to the cattle at times of scarcity of fodder.

As regards (1) no provision is made for feeding cattle in Orissa and no fodder crop is grown. There are practical difficulties also in the way ; an average cultivator's holding is much too small for growing his own food crops, his cash crop and also fodder for his cattle. Rice straw is the only thing that the cultivator has for the purpose, but its supply after meeting his requirements for thatching his house, etc., is generally not sufficient to carry him through the year.

(2) The other alternative is to grow some fodder trees on the village land and also on the lower cultivated land susceptible to flood. Trees like Asan (*Terminalia tomentosa*) Babur (*Acacia arabica*), etc., may be grown with little difficulty on land which occasionally go under flood water for a few days at a time during the monsoons. Asan leaves are liked by cattle and Babur pods are eaten with great relish by them and if fed to milch cattle they help in increasing the milk yield. Trees like *Sesbania grandiflora, Moringa pterigosperma, Albizzia lebbek,* thornless cactus (Opuntia Sp.) etc., grown on the village high lands may be of great help in meeting the situation, as their leaves have some fodder value and are readily eaten by cattle. There may be many more trees equally or more suitable for the purpose and it is desirable to prepare a comprehensive list of such trees from all over India in consultation with the representatives from the various Provinces and States at the Conference, to enable us to select out those that are likely to be the most suitable under Orissa conditions with a view to their introduction.

II.

Note submitted by the silviculturist, Forest Research Institute, Dehra Dun.

The particular problem in which the Government of Orissa are interested is the growing of suitable trees for lopping for fodder, the leaves of which may be fed to cattle at times of scarcity of fodder caused by floods. One

great difficulty with most of the trees which are lopped by professional graziers in the North of India is that the time when fresh leaf fodder is most abundant is also the time when generally there is little shortage of grass or other fodder. In the particular case of floods this difficulty does not arise to the same extent since the floods generally occur during the monsoon when fodder leaf production is also at approximately its maximum. It is permissible, therefore, in such conditions to include deciduous trees for growing for the particular purpose of relieving shortage of fodder caused by floods.

It is emphasised that it is not likely that plantations can be raised successfully in areas where annual or frequent flooding is experienced, as it is unlikely that tree seedlings will stand complete submergence when very small. If the water is moving there is also danger of the seed or the young seedlings being washed out of the ground. Plantations should, therefore, preferably be made on village high lands where possible. In areas where occasional shallow flooding by water which is not moving appreciably occurs the trees may be raised by sowing on mounds or ridges, but this is necessarily expensive. Certain species, such as *Ficus religiosa*, *Ficus bengalensis*, *Ficus glomerata* could be raised in such areas using large branch cuttings.

All good fodder trees are readily browsed by wild animals and it is almost a *sin qua non* that browsing by wild animals or domestic animals be completely excluded during the early years of fodder leaf plantations. Generally fencing is the only satisfactory solution but this is very expensive and may be ruled out on this account since plantations for fodder leaf have a comparatively low commercial value. It is sometimes possible to establish fodder trees by growing them along with a faster growing thorny or unpalatable species which will protect them during their tender years. As soon as the fodder trees are big enough the thorny nurse trees are cut out. For instance Nim (*Azadirachta indica*) can be some times raised successfully by sowing Babul (*Acacia arabica*)or khair (*Avacia catechu*)or *Cassia siamea* along with it.

Certain species which grow very rapidly can also be raised without protection from browsing by wild animals if they are sown very densely and if they grow very vigorously. Mild browsing in such case only affects the sides of the dense hedges that result, and the leading shoots are able to grow up into trees undamaged. Mulberry (*Morus alba*) is an example of a species which can sometimes be raised in this manner if grown in a locality suitable to it.

Little is known so far about the proper management of plantations raised for fodder lopping but it appears that considerable waste in unavoidable. Studies of lopping as done by professional graziers indicated that a large percentage of fodder lopped is invariably left untouched by the animals which, while still hungry, will turn from a good fodder species and eat leaves of other species not generally considered good fodder. The reason for this not fully understood unless it be that leaves must be absolutely fresh when fed to the animals. If the gricultural Department could work out some method of storing tree fodder leaves by silage or other means in a form palatable to cattle, it would greatly increase the value of fodder plantations.

A list is given below of species which are considered to be suitable for lopping for fodder and which might be tried for plantations in or near inundated areas. It is emphasised that many of these species require particular soil and climatic conditions and that only those suitable to the locality in question must be selected, and it is further pointed out that species suggested for growing in areas subject to periodic inundation are those which, it is believed will stand inundation once they are established. It does not mean to say that they will stand complete submergence when very small or even partial submergence at that stage. As mentioned above special steps may have to be taken to get the plantations established in areas where occasional shallow flooding occurs :—

1. *Good fodder species which are likely to grow in areas subjected to periodic inundation* :—

Acacia arabica.—Easy to raise. Grows well in inundated areas. The pods have high value as fodder and the leaves are also lopped for this purpose. Incidently a good timber and fuel. Grows fairly fast in early youth. Is not browsed for the first year, and is useful as a protection against browsing for other specis.

Albizzia procera.—Easy to raise by direct sowing. Believed to grow well in areas occasionally inundated. Very rapid early growth. Cannot stand severe frost. An excellent fodder, but very badly browsed by wild animals and will not succeed unless completely protected.

Celtis tetranda.—Fairly easy to raise from direct sowings. Grows well in perpetually swampy localities and is not affected by occasional inundation. A good fodder but develops rather slowly. Is frost hardy but somewhat sensitive to drought when young. It pollards and coppices well. (*Celtis australius* has similar characteristics.)

Bauhinia purpurea.—A very easy species to raise. Grows fast in youth. Does not appear to be particular as regards soil conditions. A good fodder speices and is not very badly browsed if grown as dense hedge to start with.

Butea frondosa.—Grows well on badly rained and somewhat swampy areas subject to occasional inundation, but will also stand considerable drought. Is very slow in development and does not appear likely to give a high yield of fodder leaves. The fodder it produces is not believed to be very good, but it will be eaten by starving cattle.

Terminalia tomentosa.—An excellent fodder species which will stand occasional inundation and a certain degree of swampiness of the soil. Fairly easy to raise. Must be protected from browsing. Is sensitive to severe frost.

2. *Species which are extensively lopped for fodder and which may be capable of withstanding inundation but whose capacity in this respect is not properly known. (They are probably more suitable for growing on village high lands.)*—

Moringa pterygosperma.—A very popular fodder species. Grows Exceedingly fast and is very easy to raise provided that it can be protected from pig, porcupine, deer, and other browsing animals. If damage from pig or porcupime is likely, then this species is not recommended as it is almost impossible to keep it protected against them.

Morus alba.—Very easy to raise from direct sowings and if the ground is suitable develops fast. If grown in dense hedge and if browsing by wild animals is not very severe it can be raised without fencing. It gives a high yield of fodder which is not of the first quality.

Albizzia lebbek.—Similar to *Albizzia procera* mentioned above but its capacity for resisting inundation is not known. Very rapid in growth but complete protection is absolutely necessary otherwise scarcely a plant will survive.

Ficus glomderata.—An excellent fodder species giving a high yield when the trees are fully developed. Is rather difficult to raise from seed but can be raised by cuttings planted before the rains and watered upto the beginning of the rains.

Terminalia arjuna.—Easy to raise by direct sowings and is good fodder tree. Not very fast grower when small.

Bauhinia malabarica, B. racemosa and *B. variegata.*—These species are all easy to raise by direct sowings and grow fairly : fast to start with. They have somewhat different climatic requirements, *B, racemosa* generally in drier climates than the other two. They are small trees but appear likely to give a fairly good yield of fodder.

Schleichera trijuga.—A fairly good fodder, not difficult to raise but is slow to start with. Fully developed trees have very large crown and should give a high yield of fodder.

Hardwickia binata.—An excellent fodder tree growing in dry climates. Is easy to raise from sowings but grows very slowly when young. It pollards well and gives a very high quality fodder. It is believed to be capable of standing inundation but this requires verification.

Pterocarpus marsupium.—An excellent fodder and an execllent timber. Is not easy to raise by direct sowings. Planting of root and shoot cuttings is generally more successful. Grows rather slowly and is very badly browsed requiring complete protection.

Ougeinia dalbergoides.—Similar to the last but grows best from direct sowings. Is even slower in development then *Pterocarpus marsupium* but is an excellent fodder and timber tree.

Anogeissus latifolia.—Trees of this species are lopped for fodder. Is rather difficult to raise and very slow to start. Grows badly indrained clayey soils and may, therefore, stand inundations. It has light crown and, therefore, the yield of fodder is probably low.

Carallia integerrima.—A very good fodder tree which likes damp localities. Rather slow to start with and requires complete protection from game otherwise is not difficult. Will probably grow in flooded area.

3. *Good fodder species which might also be worth while trying* :—

Adina cordifolia.—An excellent fodder and also an excellent timber but is very difficult to raise. On this account is not recommended at present until the most successful method of raising has been worked out. *Mytragyna parvifolia* is similarly an excellent fodder but also difficult to raise.

Azadirachta indica.—Very easy to raise from direct sowings. An excellent fodder, much browsed and requires complete protection. Grows fairly fast in suitable localities.

Kydia calycina.—Very easy to raise and grows very quickly. Produces a second rate fodder and having a light crown is not likely to give high yield. Is not browsed appreciably by wild animals but will be eaten by starving cattle.

Stereospermum suaveolens.—An excellent fodder and very popular with professional graziers. Easy to raise but is very slow for the first 5 or 6 years. Requires complete protection from browsing animals and from pig and porcupines.

Terminalia belerica.—An excellent fodder species which is easy to raise. Rather slow to start with and very badly browsed, requiring complete prosection. Very frost tender but otherwise hardy.

Grewia tiliaefolia.—A moderately good fodder species fairly easy to raise. Grows fast when young.

Ficus bengalensis and *Ficus religiosa.*—Both are excellent fodder species somewhat difficult to raise from direct sowings. Rather more easily raised from branch cuttings. Requires complete protection when young.

Dendrocalamus strictus. (Bamboo).—A good fodder and easily raised by direct sowings or preferably by planting nursery seedlings ; grows rapidly and requires comparatively little protection.

Opuntia spp. (Thornless *Cactus*).—Porbably suitable for raising in dry areas. Will not stand inundation or sawmpimess ; is raised by planting sections of the plant, and is reported to be a good fodder.

Further information in respect of the cultivation of most of the above species can be furnished on application to the Silviculturist, Forest Research Institute. The list is probably incomplete and enquiries have been circulated to the Provinces asking for further information regarding fodder species grown in different parts of India.

III

Note prepared by the Agricultural Branch, Imperial Council of Agricultural Research.

In India a constant supply of food for cattle is of the first importance. The sources of this supply are (1) fodder crops such as *Andropogon sorghum* (Juar) cultivated specially for this purpose, (2) concentrated foods such as oil-cakes, (3) wild grasses and leguminous plants which are either fed as hay or grazed, and (4) loppings of fodder trees and shrubs. The last class are important inasmuch as they form the chief source of food supply at a time of scarcity or in regions where other forms of food are difficult to obtain; such regions, for instance, are the slopes of mountains, dry and arid tracts, and low coastal areas liable to inundation. A list of tree-fodders, the loppings of which can be utilised for fodder purposes is enclosed but considerable work is required to be done on them before their suitability for different regions is known.

In flooded areas, the nature of food, depth of water, strength of the current, etc., are important factors. The first and foremost consideration in establishing plantation in such regions is to grow the plants in places from where the young seedlings will not be washed away by the current of water. In lands where water remains shallow, the plants may be grown on mounds or raised bits of ground but in places which do not admit of any such growth on the inundated fields, recourse may be had to village highlands. After the seedlings are established, care is needed to save young trees from being browsed by cattle or wild animals. Fencing being generally out of the question the plants may be grown mixed up with other trees which possess thorn or are found unpalatable by stock. After the plants have grown to such an height that they can stand the submergence of water without harm they will have passed the stage of careful nursing and will be able to thrive without much attention. Great care, however, will be needed afterwards to do lopping at the proper times so as to prevent damage to the plant. It is noticed specially in Northern India that during the monsoon when a sufficient quantity of lopping is available there is also abundant food present in the form of fodder crops and grasses. It is, therefore, necessary to store the loppings for use later at the time of scarcity. Experiments are needed in silaging the tree leaves and to see as to how far this processing can make them more suitable for stock. It is also a general experience that cattle do not relish the fresh leaves and eat them only when nothing else is available. If, therefore, by storing experiments leaves can be made into some more palatable form of food it will be saving a great wastage.

Fodder trees can also be helpful in pr areas farmyard manure, such as is at present utili fuel purposes, could be saved for manurial purposes i to villagers in some other form. One possible directi uirement is to grow a large number of fodder trees in waste grounds in villages.

A few outstanding investigations co are mentioned below :—

Feeding trials with bullocks in w *ulbergia sissoo*) leaves were introduced as part of the ani ed with a view

to obtain some knowledge of their digestibility and to see how far these leaves could be employed as articles of diet in times of fodder scarcity. Full details are given in Memoirs of the Imperial Department of Agriculture, Chemical Series, Volume 7, No. 4, by Messrs. P. E. Lander and L. C. Dharmani. As the fresh leaves produced diarrhoea and other digestive disturbances it was considered advisable to see whether the value of fodder could be improved by siloing. The results of these investigations are published in bulletin No. 158 of the Imperial Agricultural Research Institute, Pusa, 1925. The methods of siloing *Shisham* leaves as described in the note was found to be a satisfactory one for producing the reserve fodder in times of scarcity and there were indications of its proving an efficient substitute for basal green fodder in the ration. The animals had to become accustomed to the new flavours introduced in the ration but after they became accustomed they ate more. No deleterious effect whatever was noted in the quality of the milk, the yield was fairly maintained and the animals remained in perfect good health throughout the period of trial.

The coastal tract of the Kanara District (Bombay Presidency) suffers from shortage of fodder and Mr. M. S. Tuggerse, Divisional Forest Officer, Kanara Coast Division, has summed up the position in a bulletin issued by the Department of Agriculture, Bombay, No. 130 of 1926. The author has given a description of some fodder trees, which could be grown with advantage to supplement the fodder for cattle in these regions. The note is illustrated.

Fodder and Grazing Committees have been constituted in almost all the Provinces and the question of growing tree-fodders along with the other major issues of growing more fodder crops and improving the pasture lands is receiving their attention.

The enclosed list is chiefly from Duthie and shows only those trees which can be more commonly employed for fodder purpose.

Tree fodders

Botanical name.	English or vernacular name (in general use).	Geographical distribution.	Eaten by	Part used.
1. Acacia arabica, *Wild.*	Babul, kikar ..	Sindh, and N. Deccan (Brandis); cultivated elsewhere.	Cattle, goats, sheep and camels.	Shoots, leaves, and green pods.
2. Acacia modesta, Wall.	Phulai ..	N. W. India to Afghanistan.	Cattle ..	Leaves and blossoms.
3. Adina cordifolia.	..	..	..	..
4. Aegiceras majus, *Goertn.*	..	Sea-coast of India and on tropical sea-shores elsewhere.	Camels ..	Leaves and blossoms.
5. Aegle Marmelos, *Correa.*	Bael ..	Throughout India ..	Cattle ..	Twings, and leaves.
6. Albizzia Lebbek, *Bionth.*	Siris ..	India and Burma, Extending to Malaya, China, N. Australia, and Tropical Africa.	Cattle and Camels.	Do.
7. Albizzia odoratissima *Benth.*	..	India, extending to Ceylon and Malaya.	Cattle ..	Do.
8. Albizzia rocera.	..	..	..	..
9. Albizzia stipulata, *Boiv.*	..	India to Ceylon and Malaya.	Cattle ..	Branches.
10. Anogeisus latifolia.	..	..	..	..
11. Artocarpus integrifolia.	L. Jack tree ..	Wild in the Deccan, Cultivated in various parts of India; also in Ceylon and the Indian Archipelago.	Cattle and goats	Leaves.
12. Azadirachta indica.	..	..	..	..
13. Balanites Roxburghii, Planch.	Hingot .	Hotter parts of India and in Burma.	Cattle ..	Young twigs and leaves.
14. Bassia latifolia, Roxb.	*Mahwa* ..	Northern, Central and Western India.	Cattle ..	Flowers.
15. Bauhina purpurea, *L.*	..	From the base of the Himalaya, throughout India, and in Burma; also in Ceylon, Penang, and China.	Do.	Leaves.
16. Bauhinia malabarica.	..	..	..	..
17. Bauhinia racemosa. *Lamk.*	..	From the Himalaya throughout India, and in Burma; also in Ceylon. Extends to China and Malaya Islands.	Camels and buffaloes.	Leaves.
18. Bauhinia variegata, *L.*	Kachnar ..	Throughout India from the Himalaya, and in Burma; also in China.	..	Do
19. Briedelia montana, *Wild.*	..	N. India from Punjab to Bhutan; also in Coromandel.	Cattle ..	Do.

Botanical name.	English or vernacular name (in general use).	Geographical distribution.	Eaten by	Part used.
20. Briedelia retusa, *Spreng.*	..	Hotter parts of India and in Burma, Malacca, and Travancore; also in Ceylon.	Cattle ..	Leaves.
21. Buchanania latifolia, Roxb.	..	Hot and dry parts of India and in Burma.	..	Do.
22. Butea frondosa, *Roxb.*	Dhak ..	Throughout India and Burma; also in Ceylon.	Bullocks buffaloes, camels, elephants.	Do.
23. Carallia integerrima.	..	..	..	..
24. Careya arborea, Roxb.	Kumbi .	Throughout the hotter parts of India.	Cattle ..	Fruit.
25. Cassia Fistula, L.	Indian Laburnum or Amaltas.	Throughout India, also in Ceylon, Malaya Islands, and China.	Do.	Twigs and leaves.
26. Coltis cetranda.	..	..	..	..
27. Cocos nucifera, *L.*	Cocoa-nut palm	Cultivated in India and in most warm countries.	Cattle ..	Refuse of kernels.
28. Corna latifolia, *Roxb.*	..	Hotter parts of India Extends to Ava and Malacca.	..	Leaves.
29. Cocos nucifera, *L.*	Cocoanut palm	Cultivated throughout the tropics.	Cattle ..	Refuse of kernel after expression of oil.
30. Dalbergia Sissoo, *Roxb.*	Sissoo tree or Shisham.	Sub-Himalayan tracts from Indus to Assam. Extensively cultivated.	Cattle Goats, and camels.	Leaves and young shoots.
31. Dendrocalamus strictus.	..	..	..	..
32. Diespyres montana, Roxb.	..	Tropical India and Burma; extending through Ceylon to Australia.	..	Twigs and leaves.
33. Ehretia laevis, *Roxb.*	Chamror (N. India).	Tropical and sub-tropical India.	Cattle ..	Leaves.
34. Ficus bengalensis, *L.*	Banyan, Bor or Bargat.	N. and Central India; often planted.	Cattle, elephants	Branches.
35. Ficus glomerata, *Roxb.*	Gular (N.-W. F. P.).	Tropical India extending to Australia.	Do.	Leaves and fruit.
36. Ficus infectoria, *Roxb.*	Pilkhan (N. India).	Hilly parts of Northern and Central India; often planted.	Cattle, elephants	Branches.
37. Ficus religiosa, *L.*	Pipal ..	Throughout India and Burma; much planted also in Ceylon.	Do.	Do.
38. Ficus Roxburghii, *Wall.*	..	Northern India and Burma, often planted.	Do.	Do.

Botanical name.	English or vernacular name (in general use).	Geographical distribution.	Eaten by	Part used.
39. Ficus Rumphii, *Blume.*	..	Northern and Central India and Burma.	Cattle ..	Branches.
40. Garuga pinnata, *Roxb.*	Kharpat (N. India).	Throughout India from the Himalaya. Extends to Malaya Archipelago and Philippines.	Elephants ..	Do.
41. Gmeline arborea, Roxb.	..	India and Burma. Extends to Malayan and Philippine Islands.	Cattle	Leaves, fruit.
42. Grewia asiatica, *L.*	Paalsa	N. and Central India often planted for its fruit.	..	..
43. Grewia laevigata, *Vahl.*	..	Outer Himalaya and throughout India, and in Burma. Extends to Malaya Islands and Australia.	Cattle ..	Leaves and Twigs.
44. Grewia tiliaefolia, *Vahl.*	..	From the Himalaya in hot dry forests throughout India.	..	Twigs and leaves.
45. Hardwickia binata, *Roxb.*	Anjan (C. P. Provinces).	..	Cattle ..	Leaves.
46. Heterophragma Roxburghii, *DC.*	..	Central India and W. Deccan.	Do.	Do.
47. Hymenodcityon excelsum, Wall.	..	Sub-Himalayan tract Deccan and Central India extending to Java.	Do. ..	Foliage.
48. Kydia calycina.	..	..	..	..
49. Melia Azadirachta, *L.*	Neem or Nim	Throughout India; cultivated or self-sown.	Cattle sheep, goats and camels.	Leaves.
50. Melia Azaderach L.	Persian Lilac, Bekain.	Cultivated throughout India, and in most tropical countries. Wild in N. India.	Cattle, sheep and goats.	Leaves, fruits.
51. Morinda tinctoria *Roxb.*	Al	Throughout India. Extending to Ceylon and Malacca.	Cattle ..	Leaves.
52. Moringa pterygosperma, Gaertn.	Horse-raddish tree.	Wild in N. India; cultivated elsewhere, and in most tropical countries.	Cattle ..	Leaves, twigs.
53. Morus indica, *L.*	Tut Bengal ..	Wild and cultivated in N. India, Extends to China and Japan.	Cattle ..	Do.
54. Morus serrata, *Roxb.*	..	N. W. Himalaya; wild and cultivated.	Do.	Twigs and leaves.
55. Mytragyna parvifolia.	..	..	..	..
56. Odina Wodier, *Roxb.*	..	Hotter parts of India	Cattle, elephants	Branches.

Botanical name.	English or vernacular name (in general use).	Geographical distribution.	Eaten by	Part used
57. Outgeinia dalbergio ides, *Benth.*	Sandan (N. (India).	N. and Central India	Cattle ..	Branches.
58. Petrocarpus ..	Marsupium ..	An excellent fodder tree.	..	..
59. Piptadenia oudhensis *Brandis.*	..	Oudh	Cattle ..	Leaves.
60. Populus nigra, L. var. pyramdidalis.	Lombardy Poplar.	Cultivated in Punjab plants and N. W. Himalaya.	Cattle ..	Branches.
61. Premna integrifolia, *L.*	..	Bengal, S. India; extending to Ceylon and N. Australia.	Cattle ..	Leaves.
62. Prosopis spicigera, *L.*	Jhand (Punjab)	N. W. India; extending to Persia.	Cattle, goats and camels.	Leaves and pods.
63. Quercus incana, *Roxb.*	Ban. ..	Outer Himalaya, from India to Nepal; also in Upper Burma.	Cattle ..	Leaves.
64. Saccopetalumtom entosum, HK. f and T.	..	Oudh Terai, Behar, Orissa and southwards to Travancore.	..	Do.
65. Salix acmophylla, *Boiss.*	..	N. W. India; extending to Persia.	Cattle ..	Do.
66. Salix tetrasperma, *Roxb.*	..	River banks in India	Do.	Do.
67. Salvadora oleoides Dene.	Jal	Plains of Punjab and Sindh extending to Aden.	Cattle, goats and camels.	Berries leaves.
68. Schleichera trijuga, Willd.	Kosum (N.India)	Dry forests of India; extending to Java.	Cattle ..	Twigs and leaves.
69. Sesbania aegyptiaca, *Pers.*	Jait (Punjab)	Plains of India and in other hot countries.	Do.	Leaves.
70. Sesbania grandiflora, *Pers.*	..	Cultivated in India; extends to Australia.	Do.	Young shoots and leaves.
71. Sterculia colorate Roxb.	..	Subtropical Himalaya, and Central Provinces, Burma.	Do.	Twigs and leaves.
72. Stereospermum suaveolens.	..	..	Cattle ..	Do.
73. Tecoma undulata, G. Don.		Plains of N. and W. India extending to Arabia.	Cattle ..	Do.
74. Terminalia Arjuna	..	..	..	..
75. Terminalia belerica. *Roxb.*	Bahera. ..	Plains and lower hills of India; also in Ceylon; extending to Malaya.	Do.	Twigs and leaves.
76. Terminalia Chebula, *Retz.*	Harar (Punjab)	N. C. India and also in Ceylon extending to Malaya.	Do.	Do.
77. Terminalia tomentosa *W. and A.*	Sain (N. W. India).	N. and Central India and Burma; also in Ceylon.	Do.	Do.
78. Wendlandia exserta, *D.C.*	..	Dry forests of tropical Himalaya, Central India.	Do.	Do.

NOTE ON SUBJECT No. 15.

NECESSITY FOR THE ESTABLISHMENT OF PROVINCIAL LIVESTOCK ASSOCIATIONS AND CATTLE IMPROVEMENT FUNDS.

By

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It is a truism to say that collective and corporate effort and the pooling of individual resources are as essential to success in livestock industry as in every other department of human activity. It is particularly so in the case of the Livestock industry in India. In spite of its undoubted potentialities for improvement the Indian Livestock industry is in a very undeveloped state. The livestock of the country is scattered in the hands of very poor owners who keep only small numbers, who look upon crop production as the main source of their subsistence and who so illiterate and poor that individual effort, if any, is bound to be ineffectual. The only escape from this helpless condition is through suitable Associations, which can secure the help and the guidance needed by the industry and which can commend sufficient funds and brains to utilise scientific knowledge and the experience gained elsewhere. Indeed, barring differences in the economic condition of the people, other countries of the world which have successfully exploited their livestock were once in a similar state. The first step to general livestock improvement was taken by landlords, for the most part wealthy, and then in co-operation with their tenant farmers formed the foundation of the present breed Societies, which are now self-supporting. Through the continued efforts of these Societies livestock in Great Britain has been raised to its present high level of excellence.

Although a few societies exist in India sufficient examples are not available to illustrate what such co-operative institutions could do towards building up a successful livestock industry. The formation of the Sahiwal Society—the first breed society in India — is practically completed. In foreign countries numerous associations can be cited which are responsible for the striking results obtained. It is in fact clear that the development in the industry in the various countries has been in proportion to the numbers of such institutions. In these advanced countries the associations are of a specialised kind and are established for carrying out the different functions in the development of the industry. Taking cattle for instance the two important types of associations are the societies for registration of Pedigree and societies for the recording of milk yields. Almost every known breed of cattle, poultry, sheep, goats and pigs has an association of its own. It is through the work of these associations that the herds or cattle which started with an annual yield of, say 2,000 lb. milk a century ago is now yielding ten times as much. The origin of these breed societies can be traced to a few individuals who formed into a nucleus, which, as results became known, drew more and more members into its fold and grew into the powerful societies of to-day. The different kinds of societies acted and reacted on one another and the knowledge unfolded by studies of their records by students of science gave considerable momentum to the starting and functioning of such associations.

With the advent of the distinguished Chairman of the Royal Commission on Agriculture as the Viceroy of India the subject of livestock improvement has come to the fore. It has been discussed at various meetings, notably by the Standing Cattle Breeding Committee of the Imperial Council of Agricultural Research and the Livestock Improvement Committee of the Second Animal Husbandry Wing Meeting. The main conclusions and recommendations arrived at by these bodies are reproduced in Appendix.

It is clear that apart from the part to be played by Government it is not possible to give effect to these essential recommendations unless suitable associations are formed in the Provinces. Indeed, Cattle Conference held in Simla in May 1937 under the auspices of the Viceroy examined this subject further and recommended *inter alia* :

> That there should be set up in each Province either a Provincial Livestock Improvement Board with suitable district or local committees or a Provincial Livestock Improvement Association with district branches. It would be for each Province to decide what form of organisation to adopt. It would largely rest with district and local committees or branches to maintain local enthusiasm and raise further funds.

This Conference also laid down that there should be the closest liaison between the several Ministries of Agriculture and such Boards and Associations, and this object expressed the desirability of such bodies including in their membership permanent officials connected with livestock improvement.

As a result of this resolution and the general enthusiasm produced by the Viceroy's appeal a number of associations have been started all over the country. They vary in details, but essentially the main object is to promote the economic interests of their members by improving their cattle. These associations mainly concern themselves with the distribution of stud bulls and the registration of their services. These have only recently been started and except in one or two instances reports of their actual working are not available. It is desirable that all Provinces and States have an association of the type recommended by the Cattle Conference—that is, a Provincial Association with a branch in every district. Such associations now exist or are contemplated in some but not in all Provinces. And these associations may frame their programme of work in accordance with the recommendations of the Cattle Breeding Committee of the Imperial Council of Agricultural Research and Animal Husbandry Wing Cattle Improvement Committee reproduced in the Appendix. It is too early to lay down anything more specific at this stage. By the next Animal Husbandry Wing meeting we may have the reports from many Provinces to consider and it is hoped that based on the experience gained it will be possible to advise programmes on more definite lines suitable to the conditions obtaining in each Province and State.

It is certain that much if not all the benefit from His Excellency the Viceroy's presentation bull scheme will be lost, unless the interest aroused is continued and the only way in which this can be done on the ever-increasing scale necessary is by the formation of such Cattle Improvement Societies, whose duty it will be to watch over the care and maintenance of the bulls, and

the castration of undesirable bulls, the recording and registration of cows served by them and registration of their progeny, the selection from amongst the progeny of suitable animals to be acquired and further distributed as improved bulls and cows.

This note is only a brief outline of the subject and is submitted in the hope that it will serve as a basis for full discussion, and produce a crop of constructive considered resolutions for further guidance.

APPENDIX

The conclusions and recommendations of the Standing Cattle Breeding Committee of the Imperial Council of Agricultural Research and the Livestock Improvement Committee of the Second Animal Husbandry Wing Meeting.

(*a*) In order to effect cattle improvement on a broad scale it is necessary greatly to extend controlled breeding in areas where definite type exist and that subsequently as large numbers as possible of selected bulls from these areas should be employed in areas where at present there is no definite type.

(*b*) Where the cattle of an area are sufficiently pure the recording of approved stock in official herd-books should be taken up provincially. Such recording would be quite distinct from the official registration of pedigree stock of dairy breeds of all-India importance which is now being taken up by the Imperial Council of Agricultural Research.

(*c*) In order to ensure a continuous supply of pedigree or approved bulls it is necessary to establish pedigree breeding in selected areas.

(*d*) In order to carry on continuous improvement it is necessary to record accurately the services of all approved bulls and to register their credited progeny. For this purpose it is necessary to employ extra staff at the rate of one suitably qualified inspector and subordinate staff per 50 bulls.

(*e*) It is not possible at present to carry out strict registration of pedigree stock under village conditions of breeding nor to undertake milk recording in villages without special staff.

(*f*) It is felt that a great deal of good could be done if the herds maintained in jails, mental hospitals, etc., at Government expense, and at Pinjrapoles were more extensively utilised for the breeding of pedigree stock, and at such institutions strict milk recording should be feasible. It was also suggested that inducement might be given to the Military Dairy Farms to rear the best of their young male stock of indigenous breeds and to suit their breeding policy as far as practicable to the accepted policy of the country, *i.e.*, the improvement of indigenous breeds. It was also suggested that small herds of pure-bred indigenous dairy cattle should be maintained at Government Seed and Demonstration Farms.

(*g*) For the maintenance of bulls it is necessary to establish funds the proceeds of which should be spent partly for the purpose of bulls and partly for their maintenance.

(*h*) Wherever bulls are provided by Provincial or District Cattle Breeding Associations it is essential that provision be made from the same source for their maintenance. Otherwise it may not be possible to accept them.

(*i*) Arrangements should be made for the castration of inferior stock in areas where approved bulls are at work. In regard to compulsory castration it was decided that an enabling Act would be an advantage in most Provinces and States, but that it would be very necessary to exercise tact in its aplication. It could only be applied where the great majority of breeders were agreeable and where arrangements could be made to suppply an adequate number of suitable bulls to serve the cows in the area concerned.

(*j*) Interest of the ryot in cattle improvement should be aroused by such measures as periodical cattle shows and the award of prizes and *sanads* to those who had taken special interest in cattle breeding. Provincial or State Cattle Breeding Societies would also help to arouse interest in cattle improvement but it was considered that such societies need be formed only where satisfactory breeding control does not already exist.

(*k*) In order to encourage people to take interest in pedigree stock it is advisable to give permanent protection against Rinderpest to all registered stock free of cost.

(*l*) For the present, services of approved bulls should, as a rule, be given free of cost, but in certain Provinces the system of charging fees should be developed.

NOTE ON SUBJECT No. 16.

THE IMPROVEMENT OF THE INDIGENOUS BREEDS OF HORSES.

By

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Introduction.

The pre-historic literature, particularly the epics, refer frequently to prowess in horsemanship and the type and quality of horses then available in this country. Mention has been made in the Oxford History of India that as early as 322 B. C. during King Chandra Gupta Maurya's era the number of saddle horses in this country was perhaps greater than in any other part of the world, the number in the cavalry and two or four horsed chariots being 80,000 and 8,000 respectively. At Panipat, in 1761, the figure for the cavalry engaged is reckoned at 100,000 and further in 1780 the cavalry force of Hyder Ali of Mysore is estimated at 40,000. All this information, though extremely interesting from the point of view of statistics, throws little light on the general question whether any definite breeds or types as we understand them to-day, existed in this early mythological and historical period. Another point that has to be borne in mind, and which presents real difficulty while assessing an answer to this query, is the wide variation in descriptive standards adopted during early times and in the present era, in regard to the terms ' breed ', ' type ', etc. The sciences of Genetics and Animal Husbandry, which have made rapid strides during the last 50 years, convey something specific when terms referred to above enter into the description of the various classes of livestock.

Following the course of events in history, it is again observed that from Aurangzeb's reign onwards, for about 150 years, chaotic conditions prevailed in this country and during this period of internecine warfare the types of horses and ponies became scarce and scattered which gradually led to their degeneration and—but for a few remnants—to subseqent extinction. Later, in the beginning of the last century with the advent to power of the East India Company the question of rehabilitating the Indian horse breeding industry was again taken up, particularly with a view to making India self-sufficient in the matter of horses for her defence and other purposes. Initially the operations were confined to the less suitable Province of Bihar but later when the Army Remount Department took over the control of horse breeding operations these activities were extended to more favourable areas, *i.e.*, the Punjab colonies which were then being established. From then onwards these activities, though primarily intended for a specific purpose, contributed considerably towards the improvement of this decaying and forlorn industry and were able to demonstrate that India was as capable as any other country in the world, of producing excellent saddle horses, a fact which is confirmed by the improvement shown by General Parrott's stud in 1876-92, the Probynabad stud and other Indian cavalry

studs, the Renala Coleyana and the Mysore studs. This improvement, however, was effected mainly by the introduction of imported blood, namely the Thoroughbred and the Arab.

General description of the Horse Breeding Industry.

Apart from the activities of the Army Remount Department, Baluchistan, North-West Frontier Province, United Provinces, Hyderabad, Mysore and other Provinces and Indian States, notably in Kathiawar and Rajputana, have always evinced interest in horse breeding, and sporadic individual attempts have also been made by horsefanciers in the different parts of the country. Right along the Tibetan broder of the British Indian Territory we still find evidence of such interest and this is to some extent responsible for the existence of the ' Bhutia ' type of pony met with in sub-Himalayan tracts of the United Provinces, Bengal, Punjab, and possibly Bihar. There is little evidence, however, of the prosecution of any settled or definite programme in regard to breeding activities and adaptation to new conditions. The keen insight shown by breeders in other parts of the world has been sadly lacking and very little cognizance has been taken of the ever increasing knowledge regarding genetical and breeding problems which is mainly responsible for the present day achievements of the premier livestock producing countries. One of the main reasons, therefore, why progress in livestock improvements has not been appreciable, is that the work has been in the main spasmodic and without any systematic control of breeding or education of breeders in the better care of their stock. Further, the necessary impetus this industry should have received from the land owning classes, who in view of their status and vocation, have been mainly instrumental for such improvement in other countries, has rarely been forthcoming. Along with these factors the other important contributory causes which have been responsible for the disorganised condition of the industry are the lack of proper incentine to breeders in the shape of properly organised and developed markets and dearth of adequate knowledge or facilities regarding nutritional and disease problems. In addition, the most important cause of the decline, all over the world, is the increasing use of machinery and mechanisation of the Army. All these taken together account for the degeneration of horses and ponies in this country, and the inevitable consequence is that, with few laudable exceptions, the horse breeding industry is now left to the resources of the agricultural masses who, however, keen they might be, can ill-afford to keep it going.

Again the rural population in this country has always looked upon crop production as its only concern and source of income. For this reason, therefore, when a crop fails, the Indian agriculturist community sinks low, as there is no other allied industry which can help it to tide over the period of scarcity.

Total population and the distribution of Horses in India.

Figures published in 1936 by the International Institute of Agriculture, Rome, indicates that India ranks as 9th country in regard to the total population of horses in the world while the U.S.S.R. tops the list and Great Britain and Ireland taken together range as 16th in this list.

According to the cattle census the total population of horses in British India excluding Bengal, Bihar and Orissa has increased from 1,393,749 in 1930 to 1,408,622 in 1935 showing an increase of 14,873 during the interval of five years. As will be evident from the table below the largest number is located in the Punjab, the United Provinces, Bihar and Orissa, and then in the Central Provinces and Bombay.

Number of horses and ponies in India in 1935.

Provinces.	Horses and Ponies.				
	Horses.	Mares.	Young Stock.		
			Under one year.	Colts and fillies. (One to three years of age.)	Total.
1. Ajmer-Merwara	1,953	1,864	482	330	812
2. Assam	11,869	6,020	..	..	2,041
3. Bombay	61,669	39,706	..	..	15,215
4. Burma	23,223	25,792	..	..	7,129
5. Central Provinces and Berar ..	66,845	52,532	..	..	26,188
6. Coorg	224	71	4	6	10
7. Delhi	3,544	1,713	150	839	989
8. Madras	32,938	14,362	3,391	2,173	5,564
9. N. W. F. P.	9,455	10,743	619	677	1,296
10. Punjab	122,153	216,011	..	..	60,584
11. Sind	33,076	39,294	1,263	6,443	7,706
12. U. P.	231,400	200,493	..	..	74,138
13. Bengal*	69,955	34,182	..	..	9,396
14. Bihar and Orissa*	112,848	60,074	..	..	21,223
15. Baluchistan*	6,494	9,344	..	..	1,792
Total ..	787,646	712,201	..	..	234,083

* Relates to 1930 Census.

Measures for Improvement and the small area covered by the Army Remount Department.

A large proportion of this existing population, scattered all over the country, is comprised of a nondescript type. Measures for Improvement which are discussed in some detail below are effected by the Provincial Governments through District Boards of other suitable agencies. The activities of the Army Remount Department are confined mostly to small arreas in the Northern Provinces of India, namely the United Provinces and the Punjab. The particular districts in the Punjab where the Army Remount Department concentrates its activities are Sargodha including Shahpur and Montgomery, Lyallpur comprising the districts of Lyallpur, Jhang and Sheikhupura, and Rawalpindi comprising the districts of Rawalpindi, Jhelum, Gujarat, Attock and Hazara. In the United Provinces their work is confined to the districts of Meerut, Muzaffarnagar, Aligarh and Bulandshahr. The activities of the District Boards in these localities in regard to provision and supervision of stallions are also supervised and guided by the Army Remount Department. In addition, in the Bombay Presidency the Department maintains a stud farm at Ahmednagar. The number of horse stallions maintained in these districts in 1934 was 313.

The following types of horses are either bred or used by this Department :—

Thoroughbred English (T. B. E.).

Thoroughbred Australian (T. B. A.).

Arab.

English Arab.

Thoroughbred Indian (T. B. I.).

Indian stud bred (I. B.).

Number of stallions (other than Army stallions) at stud in Provinces and States.

Majority of the annual reports of the Provinces and States do not contain any data in regard to this point and it is presumed that wherever this information is lacking no specific action is being taken by the Provincial or State Government concerned in the matter of improvement of local stock. The few reports which furnish some details about horse breeding operations are those of the North-West Frontier Province, Sind, the United Provinces, Baluchistan and Hyderabad. The number of horse stallions at stud in these areas in 1936-37 was 12, 5, 48, 7 and 35 respectively and in addition a pony stallion was stationed in the North-West Frontier Province. One stallion was purchased during this year by the District Board, Coimbatore and an Arab stallion was issued by the Civil Veterinary Department, Punjab.

Result of enquiries by the Imperial Council of Agricultural Research regarding existing breeds or types of indigenous horses and ponies in various parts of India.

For sometime past the Council has been trying to collect information n regard to this subject but inspite of persistent efforts the information still

remains unsatisfactory. Perhaps it is not necessary to stress the importance and utility of such information which if available from all parts of India could be arranged and made available in a suitable form. However, the informaton. collected so far in regard to the indigenous breeds (or more appropriately types) existing in different parts of the country is summarised below :—

North-West Frontier Province	Waziri. Baluchi.
Bengal	Bhutia (pony).
Assam	Manipuri (pony).
Punjab	Unmol, Baluchi, spiti.
Punjab and Rajputana Agency ..	Marwari.
Punjab and Western India States Agency, United Provinces and Bihar.	Kathiawari.
United Provinces	Bhutia. Jumla (pony).
Sind	Jacobabad Baluchi and Makra.
Bihar	Shahabad (pony). Bhutia (pony).
Kashmir	Zanskari (pony).

Available descriptions of some of the above breeds.

UNMOL.

The various families of this breed are known as Harna, Morna, Hazziz and Sheehan, all of which are referred to as ' Unmol ' meaning ' priceless '— the name being attributed to the great value and preference put upon this breed. These animals were bred in the districts of Shahpur, Jhang, Rawalpindi, Jhelum and Pindi Gheb. The type is described as being very strong, elegant and shapely and possessing a long mane and a compact body. The popular colours are Bay and Grey. The height is given as 15 hands and 1 inch and the body weight between 800 to 900 lb. The tradition is that the ancestors of this breed were brought by Alexander the Great when he invaded India. Inspite of all the efforts made some years ago by the Army Remount Department to resuscitate this breed, it is now practically extinct and although various Maliks of the Punjab States maintain some ' Unmols ' possibly none of them are pure and contain to varying degrees the blood of imported Thoroughbreds and Arabs.

KATHIAWAR AND MARWARI.

The many common characteristics in these breeds indicate that possibly both of them have a common ancestry, the variations noticed being possibly due to different environmental and climatic conditions under which they are reared. These animals are largely bred in the Rajputana and Kathiawar States and the rulers interested in the Kathiawari breed have incurred enormous expense in establishing it. The ancestors of these breeds are said to be imported Arab stallions, a ship load of which was wrecked on the west coast

of India and Arab horses ran wild in the jungles of Kathiawar and Bombay Presidency. That it possesses considerable strain of the Arab is evidenced by the head of the animals but a curious and somewhat prominent feature of the breed is the prevalence of bent hocks. The Western India Turf Club has been very helpful in maintaining the breed by patronising the organisation of special races for Kathiawar horses. They are very hardy and enduring animals and it is possible that they could be developed in size and speed in case there were greater facilities available to the mares and young stock for liberty and grazing.

The breeding of stallions of this class by the Army Remount Department has in recent years been discontinued, owing to increased difficulty in procuring pure bred Kathiawari and Marwari stallions.

Dhunnis and Deccanis.

Amongst the other indigenous breeds which are also now extinct were the Dhunnis and Deccanis and it is believed that their ancestors were imported Turkoman, Arab, Persian, etc.

Baluchis and Waziris.

These breeds which are quite different from the above breeds appear to have descended from the common stock. The former is found in Waziristan and is well-known for its strong, medium conformation and stamina for hard and fast work in the hills but is now-a-days rather scarce and impure. The latter, *i.e.*, the Baluchi, which is of larger size is found in Baluchistan and Dajarat which consist of districts of Dera Ghazi Khan in the Punjab and Dera Ismail Khan in the N.-W. F. P. These animals possess a medium sized head well set with a medium and well developed neck. The forehead is wide, muzzle small and fine, the shoulders well placed, chest broad and well developed, back fairly long, croup protruded, arms, hind quarters and thighs muscular, cannons short and bones inclined to be fine. The ears are rather long, pointed and turned inwards and inclined to meet at the tips. The last feature is regarded as a typical characteristic of this breed. The height is about 14 hands 2 inches and the body weight approximately 830 lb. These animals are described as elegant, shapely and fast runners.

Spiti (Pony).

This breed exists in the Spiti tracts which lies in the Kulu sub-division of the Kangra districts. It is praticularly hardy and sure-footed and averages about 12 hands in height. These animals possess good bone and well developed compact body and are more suitable for hilly areas. Their legs are covered with coarse long hair. They are used for pack purposes or for riding. The rearing of these animals is an important source of income to the inhabitants of the Spiti tract and there is considerable trade with Chumurti-Tibet, Rampur and Jammu States and the Kulu Valley. These ponies are principally bred by farmers who keep two or three mares and seldom more than half a dozen. The Lahaul people also import these ponies and use them for pack or riding. In the Kulu subdivision, Yarkand, Lahaul, Zanskar and Ladakh these ponies are regarded as a distinct breed. The prevailing colours are

dark grey, iron grey and the dun but occasionally bay and black are met with. Cream colour is, however, rare. These animals can be reared in cold regions only and are capable of withstanding adverse conditions such as scarcity of food, long journeys, etc.

BHUTIA.

As stated above these animals are found in the sub-Himalayan regions. The common colours are grey and iron grey though occasionally chestnut and roans are also encountered. The height of a good pony averages between 13 to 13·2 hands and body weight between 500 to 600 lb. The prominent features are :—

Compact body, fairly raised nasal bones, broad forehead, short thick neck, broad chest, straight shoulders, long back, good bone, well-ribbed barrrel, round muscular quarters, coarse hairy legs and long tail and mane. The feet are fairly open at the heels. This type is rather popular in the hills and is used for riding as well as for pack purposes. Practically all the typical imported in this country are either geldings or above the breeding age.

JACOBABAD BALUCHIS.

They are described as a fine breed of hardy, spirited and active animals rather showy in action. They possess clean limbs, good bone, thin long neck and fairly long head.

MAKRA.

The average height of this type is stated to be usually a little over 14 hands. They are well built with good shoulders, deep and moderately broad chest and angular drooping quarters. They have a peculiar gait commonly called "*Sindhi Pandh*" which is very much appreaciated and looked for by the intending purchasers.

MANIPURI (PONY).

This type is bred in the Manipur State in Assam.

ZANISKARI (PONY).

The habitat of this type is Zanskar in the Ladakh district. It is said to possess a compact body and good bone. Due to its size and body weight, it is best suited for hilly tracts and wherever used has proved of utmost utility.

Lines of improvement.

This is rather a big issue to be dealt with in this brief resume. However, the broad outlines for a plan of improvement would be somewhat similar to those set forth by the Council in regard to improvement of other forms of livestock, particularly the Indian cattle. The demand for high quality horses in India is limited and what little demand there is, is being met to a large extent by a system of cross-breeding fostered by the Army Remount Department in a few selected districts. It is, however, felt by many interested in this subject that the pace could be accelerated and attempt made not only to produce the type suitable for Army purposes but also to evolve a breed of Indian

Thoroughbred which would suit the country's need for both racing and general purposes and also with the possibility of competing in the world supply of high class polo ponies.

Apart from the Army Remount Department, the other agencies that are at present associated with the question of the improvement of this industry are the Turf Clubs and the National Horse Breeding and Show Society of India. The former, which are independent and unsubsidised organisations, have been providing about two lakhs of rupees annually for meetings closed to Indian bred horses and have in addition contributed funds to the National Horse Breeding and Show Society, which are being utilised partly for the development of horse breeding in selected districts and partly at the Imperial Veterinary Research Institute, Mukteswar, and the Army Veterinary Laboratory, Lahore for research into equine diseases, which vitally affect the horse breeding industry in this country. It is hoped that with increasing interest in the Indian bred horses the contribution of the Turf Clubs towards such development will be equally substantial. The latter organisation, *viz.*, the National Horse Breeding and Show Society has also, since its inception, taken a prominent lead in this matter.

This is, however, just one aspect of the problem. Another, but more important one, is the question of the improvement of the indigenous types existing in this country. Nothing that has been said so far is intended to imply that in an attempt to exploit her own valuable market, India should breed nothing but race horses. That would be an incorrect policy, for it is the indigenous animal that plays real part in the life of the great mass of people, among whom are the agriculturists who are not interested in the bigger animals such as are used by the Army or as packs, etc. To some extent the indigenous types still meet the demand for pack animals, saddle horses or tonga ponies and in many parts of the country, particularly in hills and submountain tracts, they serve as the only means of transport. In such parts the villagers have to depend mainly on these animals for their daily routine and livelihood.

In taking up the question of the improvement of the indigenous breeds the point that needs particular stress is that it is not speed but endurance that is required in these animals. The test of the race course, therefore, which inevitably induces the breeders to sacrifice everything for speed, is not only not necessary but in fact, as we know today, may prove disastrous. An instance to this is the famous Pegu pony of Burma which some 30 years ago was renowned all over the East for its powers of endurance is now, due to the adverse influence of racing, as difficult to find in Burma as some of the abovementioned breeds, as for example the Unmol, in India. However, some distinct advantage would certainly accrue if some long distant races could be arranged with a view to test the stamina and performance of the indigneous animals.

The initiative in regard to the plan of improvement which has to be started *ab initio* has to originate from those Provinces and States which contain definite breeds of horses and ponies. For reasons enumerated in the initial portion of this note official assistance and encouragement would be necessary in the early stages of the work. Simultaneous cooperation of the

breeders and the public will, however, be extremely necessary as in the case of cattle breeding. The history of such development in other countries has shown that progress in such matters can be achieved and maintained only if non-official organisations take an active interest and gradually shoulder the entire responsibility. The first essential requisite for the plan under consideration would be a survey of the position all over the country and the selection of tracts where suitable breeds or types exist. Suitable stallions and mares would then be selected for the purpose of establishing the foundation stock. This would be followed by systematic and controlled breeding and grading up of the progeny. Rules and regulations also need to be framed regarding the use of stallions and registrations of the accredited progeny. As experience with other forms of livestock has shown that best results are invariably correlated with restricted activities the plan of improvement should be confined primarily to small areas. The veterinary dispensaries which are maintained all over the country could be utilised as breeding centres and for locating the approved stallions.

Along with the general observations noted above some of the other provisions that would be necessary are :—

(*a*) systematic castration to prevent promiscuous breeding,

(*b*) adequate facilities for investigation and control of diseases and due attention to proper nutrition and management, particularly of the young stock,

(*c*) the encouragement of competition by means of fairs and shows and propangada in regard to the results of better feeding and management,

(*d*) a ready and profitable market, and

(*e*) initiation of stud books eventually.

These are roughly the bare outlines which could pave the way for better organisation of this industry. Not only would systematic efforts on these lines lead to an improvement in the horse population of a particular Province or State but would also provide surplus stud animals for distribution to other parts of India, where no suitable breeds exist and where there is still a demand for this class of transport animals.

In conclusion, it may be reiterated that all livestock work needs patience and concerted and dogged perseverance. The scientific production of horses, as of all forms of livestocks, should aim at something specific and utilitarian—leaving it for private enterprise to develop the " Specialist " animal such as race horses. The problem to be solved is as to who is to take the responsibility for grading up horses and find the necessary funds.

NOTE ON SUBJECT No. 17.

THE MIGRATION OF CATTLE BETWEEN PROVINCES AND STATES WITH REFERENCE TO ITS EFFECT ON (a) THE CONTROL OF CONTAGIOUS DISEASE, (b) THE BREEDING OF PURE STOCK.

By

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(*a*) There seems no doubt that the migration of cattle between Provinces and States is responsible for the spread of contagious desease and hampers to a great extent the efforts of the Veterinary Departments in the different Provinces and States in controlling disease. This statement is based on the experience gained and the evidence available in the Madras Presidency from the migration of cattle into it from adjoining Provinces and States and applies chiefly to two diseases—Rinderpest and Foot-and-Mouth disease.

These two diseases can be easily diagonsed and thus their incidence and methods of spread are fairly well known. There are, however, many other contagious diseases such as Tuberculosis, Jhone's disease and contagious abortion which are undoubtedly spread by migratory cattle but to what extent it is difficult to say. The diagnosis of those diseases in large numbers of animals under field conditions is so difficult that an accurate knowledge of their prevalence and incidence at present is lacking. I am, therefore, confining this note to Rinderpest concerning which sufficient knowledge and data are available.

Rinderpest has been kept under control in the Madras Presidency for some years now and has been restricted to certain areas ; so much so that some of the sporadic outbreaks which have occurred have afforded ample evidence to show the source of infection and mode of spread.

A scrutiny of the statistics pertaining to the incidence of Rinderpest in Madras and the adjoining states indicates that the incidence depends to a large extent on the migration of cattle either for sale or grazing, and there is no doubt that the movement of animals in large numbers is responsible for its spread. Such movements of animals on large scale occur during (*a*) the migration of cattle for grazing, (*b*) importation for sale and permanent retention in the Province, (*c*) importation of young animals into the rearing tracts and exportation later when adults.

The migration of cattle in search of grazing is seasonal. During certain periods of the year in the Madras Presidency considerable numbers of cattle proceed from the Delta areas where cultivation does not allow of pasturage, to the grazing areas in the forests. The cattle sometimes have to travel long distances before reaching the grazing areas and they usually remain there for months before returning. If Rinderpest breaks out among these herds, it is found that its spread depends on the stage at which the moving herds become infected *en route*. If infection occurs at the beginning, centres of infection will be found at various places on the route but if at the end, the infection

is confined to the grazing area. Such infected herds are a grave source of danger to neighbouring herds in contiguous Provinces and States and must be considered in any measures formulated to prevent the spread of disease by migratory cattle.

A more serious problem perhaps is the migration of cattle into the Province from fairs for sale. If Rinderpest is prevalent at the time those fairs are held, it is found to spread in all directions. There are a number of cattle fairs held annually in a State adjoining Madras from which large numbers of animals are imported into the Madras Presidency. It has been found that if this State is free from Rinderpest at the time those fairs are held, the districts in the Madras Province into which those cattle are imported remain more or less free. The position of Rinderpest, therefore, in a Province which imports large numbers of animals depends to a great extent on the prophylatic measures adopted in adjoining Provinces.

In the northern part of the Madras Presidency there is a rearing tract, as distinct from a breeding tract, in which there is always a big incidence of Rinderpest. It is customary for the ryots of this area to buy young stock and rear them for sale. There are no grazing areas in this tract and the movement of the stock is entirely for trade purposes. No large cattle fairs are held but the young stock are taken partly from the northern part of the district and also beyond it in another Province along one route throughout the year. They are brought South from shandy to shandy until sold and then the reverse movement in adult cattle occurs. The same dealers purchase adult stock for sale in the northern parts of the district and outside it in a neighbouring Province. This movement is perennial and it helps to explain the persistence of Rinderpest in this district for some years now in spite of a large number of inoculations being conducted. There is a continuous replacement of the cattle population which nullifies to a certain extent the inoculation campaign. It seems, therefore, reasonable to conclude that the migration of cattle between Provinces is responsible for the spread for Rinderpest and some suitable prophylactic measures would appear to be necessary.

It has been stated that with modern methods of prophylaxis against Rinderpest there is no reason why cattle should be allowed to die at all from it. Those who believe in this dictum have not stated specifically whether the much desired object can be achieved by creating immune belts in order to screen the unaffected areas from the affected or by adopting a policy of mass inoculations so as to leave no animals or only a very small percentage of them susceptible to the disease. The former implies co-ordinated action on the part of Provinces and States and the adoption of a common policy and methods. Under the present varying conditions in the different Provinces and States, *e.g.*, finance, staff, etc., this method is hardly feasible at present and will remain so for some time. The latter method does help in checking the spread of the disease in a Province and its effectiveness is in direct ratio to the percentage of animals immunised.

To prevent Rinderpest from spreading across a frontier some control over the cattle going for grazing to a frontier area or crossing it either for

sale or afterwards or during ordinary traffic is necessary. The complete prohibition of the movements of cattle by legislation is not practicable owing to the existence of large areas which for many months in the year cannot sustain the cattle population which have of necessity to be sent away for grazing. There are other areas which depend on other Provinces and States for the replacement of their animal wastage to make good the numbers required for cultivation purposes. It seems, therefore, that the traffic in cattle between Provinces and States must continue.

In suggesting some prophylactic measures for consideration, it must be understood that I am only dealing with Rinderpest although there are many other diseases of equal importance but their prevention at the present time does not appear to be practicable. Even with Rinderpest prophylactic measures to prevent its spread by migratory cattle will not be easy. An experiment is being tried in selected areas in the Madras Presidency whereby animals going to the forests to graze are not permitted to do so by the Forest Department unless they have been previously immunised against Rinderpest. This scheme was first started in one of the bison areas in Madras as it was reported that the bison were dying in large numbers from Rinderpest contracted from cattle and it was introduced to prevent their extinction. There are, of course, difficulties in immunising all the animals but with a sufficient staff (large numbers of animals have to be done in a short period) and the co-operation of the owners, they are not insurmountable. If this practice were adopted mutually between Provinces in cases where there is a likelihood of Rinderpest spreading across a frontier it should be found very beneficial in checking it.

A more difficult problem is the question of dealing with animals imported into a Province for sale or during ordinary cart traffic. The effects these animals have on the control of contagious disease depend largely on the prophylactic measures adopted in those Provinces or States from which they have come. In any case some form of legislation is necessary and one similar to the Madras Cattle Diseases Act, 1866 (copy attached), if introduced in the various Provinces and States and enforced where necessary, would help in controlling Rinderpest. Under notification (3) instead of serum alone " some approved method of producing active immunity " should be substituted. Special attention, of course, should be paid to the recognised routes on the frontier through which cattle pass and the act enforced in those places when such a measure is considered necessary.

The adoption of these measures by the various Provinces and States would help in keeping Rinderpest under control. There would be fewer outbreaks and the staff would then be in a better position to deal with them more effectively.

(*b*) As regards the breeding of pure stock the policy should be to keep those areas in which this work is attempted more or less self-contained in the matter of its livestock and the migration of cattle into them should be prevented as far as possible. This does not necessarily mean that migratory cattle will always have an adverse effect on the stock in a particular area.

There are many districts, for example, where the demand for cattle has outgrown the production, necessitating the importation, every year, of a large number of work bullocks, which, of course, contribute nothing to the breed in the area to which they migrate. If, on the other hand, the animals imported are bulls and are superior to the local breed, a beneficial effect may be seen. This constant migration of cattle from the breeding areas is very necessary to encourage the breeder, and every attempt should be made to help him in the marketing of his livestock.

In areas, however, where pure stock breeding is undertaken, migratory cattle will have an adverse effect on the breed unless there is some control over them. Where there is no control over the breeding or movement of cattle, the evils of mixed breeding are seen. One or two instances may be cited. In the case of communal grazing near a village where every villager is entitled to graze his cattle, the evils of in-breeding and promiscuous breeding are pronounced. All the animals in the village, both male and female, are grazed together and as the male stock are not castrated until maturity is reached, a ryot anxious to improve his stock would find it impossible under such circumstances.

Somewhat similar conditions prevail in some of the forest grazing areas. All the stock, both male and female, are allowed to graze together and no attempt is made even to prevent them from mixing with other herds. The surplus male stock are never sold until they are full grown and no attempt at selective breeding is made. The result is a very poor type of animal.

In other areas, however, the system of breeding is different. The only cattle which are allowed to graze are the cows with their calves and with the exception of the required number of breeding bulls, which are allowed to run with the herds, no other male stock is seen. (The male stock are sold as yearlings to ryots who rear them for work bullocks.) These herds are not allowed to mix with neighbouring herds—the bulls are specially selected and the result is that a true type of animal is produced.

A system somewhat similar to this is necessary in the breeding of pure stock. The area in which it is done should be naturally suitable for stock raising and every endeavour including well organised disease control should be made to make it more or less self-contained. Cattle from outside the area should not be allowed to mix with the stock in this area and if it is necessary to import animals, then, only castrated animals should be allowed in.

If conditions are such that there is a possibility of other herds mixing with the pure herds while grazing, it would be necessary to have them isolated and special grazing areas reserved for them ; otherwise, there is a possibility that the purity of breed would be lost.

THE MADRAS CATTLE DISEASE ACT, 1866.

MADRAS ACT NO. II OF 1866.

(As modified up to 31st March 1914.)

(PASSED BY THE GOVERNOR OF FORT SAINT GEORGE IN COUNCIL.)

(Received the assent of Governor on the 16th March 1866, and of the Governor General on the 17th April 1866.)

An Act for the prevention of spread of disease among cattle in the Madras Presidency.

Preamble. WHEREAS it is expedient to take measures to prevent the spreading of contagious or infectious diseases among animals in the Presidency of Madras, and with that object, to prescribe by-law in what way animals so infected shall be dealt with ; It is hereby enacted as follows :—

Act to be extended to such places, and during such periods of time as the Governor in Council thinks proper. 1. This Act shall be put in force in such districts or parts of districts, and during such periods of time, as the Governor in Council may, from time to time, direct notification in the Fort St. George Gazette.

Interpretation clause. 2. The following words and expressions in this Act shall have the meaning hereby assigned to them, unless there be something in the subject or context repugnant to such construction :—

Magistrate. The word " magistrate " shall include all persons exercising all or any of the powers of a magistrate.

Number. Words importing the singular number shall include the plural number, and words importing the plural number shall include the singular number.

Gender. Words importing the masculine gender shall include the feminine.

Animal. The word " animal " shall mean any camel, buffalo, horse, pony, ass, bull, bullock, cow, heifer, calf, sheep, lamb, goat, kid or swine.

Establishment of hospital-pounds. 3. Whenever this Act shall have been applied, as above provided, to any district or part of a district, hospital-pounds shall be established in such places as the Magistrate of the district (or, in the city of Madras, the Commissioner of the Corporation) shall determine, and keepers shall be appointed to such pounds by the said Magistrate. The village or villages by which every hospital-pound is to be used shall be determined and notified by the Magistrate.

Notice by owner of cattle attacked by disease. 4. Whenever in any district or part of a district to which this Act has been extended as above provided, any animal is attacked by any contagious or infectious disease, it shall be the duty of the owner, or of the person in charge thereof, to give immediate notice

to the keeper of the hispital-pound provided for the village or township in which the animal may at the time be.

Examination by pound-keeper.

5. On receiving notice as aforesaid, the keeper of the hospital-pound shall, as soon as possible, examine the animal, and shall decide whether it is necessary to place it in the hospital-pound for treatment.

Removal to the hospital-pound.

6. If the keeper of the hospital-pound should be of opinion that the animal has any contagious or infectious disease, he may thereupon require the owner of the animal, or the person in charge thereof, to place it in the hospital-pound.

Inspection of places in which animals suspected to be diseased are found.

8. Every keeper of a hospital-pound, or person thereto authorized by the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation of Madras) shall have power within the range for which he is appointed, to enter upon and inspect any premises or place which any animal or animals, which he suspects to be labouring under any contagious or infectious disease, may be found, and to examine and inspect, whenever, or wherever he may deem it necessary, any animal or animals which he suspects to be labouring under such disease and to require the removal of such animal or animals to the hospital-pound for the range.

Cleansing of premises in which diseased animal has been or is.

7. Every keeper of a hospital-pound or person thereto authorized by the Magistrate of the district (or, in the City of Mardas, the Commissioner of the Corporation), shall have power, within his range, to cause to be cleansed and disinfected, in any manner which he may think proper, any premises in which any animal labouring under any contagious or infectious disease has been or may be, and to cause to be disinfected, and, if necessary, destroyed, any fodder, manure or refuse matter which he may deem likely to propagate the said disease.

Expenses for food and treatment by whom to be borne.

9. From the time when any animal affected as aforesaid taken charge of by the keeper of the hospital-pound, all expense incurred on account of feeding and medical treatment for the said animal shall be borne by the cattle-pound fund established under Act No. III of 1857, unless the owner, or person in charge thereof desires to supply the food and medicines himself:

Provided always that such food and medicines shall be such the keeper of the hospital-pound may approve or direct.

Power to destroy diseased animals.

13. The keeper of the hospital-pound, or other person thereto authorized by the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation) shall be empowered to destroy any animal either before or after it has been impounded as aforesaid, whenever, it shall appear to him to be necessary to prevent the spread of contagion or infection.

Burial of carcass.

When any animal shall have been so destroyed, or shall die whilst in charge of the keeper of the hospital-pound, it shall be the duty of the said keeper to have the carcass of the said animal buried

at least six feet below the surface of the ground, and any cost incurred in so doing shall be met from the cattle-pound fund.

Bar of claim to compensation.

No compensation shall be claimable in respect of any loss incurred by reason of any act authorized by this section.

Owner to pay costs for animal cured.

11. Should an animal impounded as aforesaid recover from the disease under which it may have been labouring, the owner or person who was in charge thereof shall pay to the keeper of the hospital-pound, to be placed to the credit of the cattle-pound fund, the actual cost of the feeding and treatment of such animal.

Recovery in case of default.

Should he fail to pay the expenses aforesaid, then the said animal shall be sold by auction and the sum realised by its sale, after deducting the amount of the expenses, shall be paid over to the owner or person who was in charge :

Owner when not chargeable.

Provided always that, in such cases as the owner or person who was in charge may elect to supply food and medicine, he shall not be required to pay any charges whatever.

Bar to removal, without licence, of animal in contact with diseased cattle.

12. No person having in his possession, or under his custody, any animal which has been in the same shed or stable, or in the same herd or flock, or in contact, with any animal labouring under any contagious or infectious disease, shall remove such animal alive from his land or premises without the licence of the keeper of the hospital-pound for the range, or of some person authorised by the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation) to grant such licence.

Licences.

Every such licence shall be in writing, and shall only permit the removal of such animal to some place where it can be conveniently kept apart from all other animals until the hospital-pound-keeper or other person authorized as aforesaid, if satisfied that there is no reasonable probability of such animal propagating the disease.

Penalty for failing to give notice when animal is attacked by disease.

13. If any person who may be in charge of any animal at the time of its being attacked by a contagious or infectious disorder shall fail to give notice to the hospital pound-keeper of the village, as required in section 4, the said person shall be liable on conviction before a magistrate, to a fine not exceeding rupees five for every instance of such neglect, commutable, if not paid, to simple imprisonment for any period not exceeding ten days.

Penalty for refusing to obey directions of cattle-pound keeper, etc.

14. Any person who shall fail to comply with the directions of a hospital pound-keeper, or of a person duly authorized by the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation), in that behalf, as to impounding any diseased animal ; or to the disinfecting of any premises or place where any diseased animal may have been kept ; or to the disinfecting or distroying any fodder, manure and refuse matter which

may be likely to propagate the disease, or who may remove, without a licence, any animal which has been in the same shed or stables, or in the same herd or flock, or in contact, with any animal labouring under any contagious or infectious disease, shall, on conviction before a Magistrate, be liable, for every such offence, to a fine of twenty rupees, commutable, if not paid, to simple imprisonment for any period not exceeding ten days.

Penalty for opposing seizure and impounding of diseased animals.

15. In any district or part of a district in which this Act is in force, hospital pound-keepers, all police officers not below the rank of a Sub-Inspector and such other persons as the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation) may specially empower, may seize and impound all animals suffering from contagious or infectious disease and any person who shall forcibly oppose such seizure or who shall forcibly rescue the animals after such seizure, shall be deemed to have committed an offence punishable under section 186 of the Indian Penal Code.

Complaint of seizure by owner.

16. Any person, whose animals shall have been seized as being diseased, may prefer a complaint against the seizure, at any time within ten days from the date thereof to any Magistrate.

Form of complaint.

The complaint may be either verbal, in which case the substance of it shall be taken down in writing by the Magistrate, or written upon plain paper, and shall be preferred by the complainant in person, or by an agent personally acquainted with the circumstances.

Procedure thereon.

If on examination of the complainant or his agent, the Magistrate shall see reason to believe the complaint to be well founded, he shall summon the party complained against, and shall proceed to make a summary inquiry into the case.

If the seizure be adjudged illegal, the Magistrate shall award to the complainant such damages as he may deem to be a reasonable compensation for any loss or injury sustained from the unlawful seizure, together with all expenses incurred by the complainant in procuring the release of the animals ; or, if the animals have not been released, the Magistrate in addition to the award of damages, shall make an order for their release, and shall direct that the expenses leviable under this Act shall be paid by the party who made the seizure.

The amount of all damages and expenses so awarded shall be recoverable according to the process prescribed in Act No. V of 1865 (Madras), for the recovery of forfeitures or penalties imposed under the authority of Act No. XXIV of 1859.

Fees and fines to be credited to cattle-pound fund.

17. All fines levied under this Act shall be credited to the cattle-pound fund established under the provisions of Act No. III of 1857, which fund shall be available for payment of all expenses incurred under the provisions of this Act :

Reward to informer.

Provided that it shall be lawful for the officer inflicting a fine under this Act to direct any portion thereof, not exceeding one-half, to be paid to the informer.

Power to make by-laws.

18. It shall be lawful for the Governor in Council by notice published in the Fort St. George Gazette, to make and prescribe such by-laws, as may from time to time seem necessary for the more effectually preventing the spreading of infectious or contagious deseases among animals, provided that such by-laws shall not be repugnant to the provisions of this or any other Act.

Penalty for breach.

A breach of any such by-laws shall render the party liable, on conviction before a Magistrate, to a fine not exceeding rupees ten, commutable to simple imprisonment for fifteen days.

[*Vide* Sub-section (*iv*) of Section IV for futher information about this Act.]

Notification (*1*).

G. O. No. 371 Revenue 15th February 1919.

In exercise of the powers conferred by section 18 of the Madras Cattle Disease Act, 1866, His Excellency the Governor in Council is pleased to make the following by-law :—

In any district or part of a district in which the provision of the Madras Cattle Disease Act, 1866, are put in force, the Magistrate of the district (or, in the City of Madras, the Commissioner of the Corporation of Madras), may close temporarily cattle markets and fairs, whether public or private, whenever he considers such a course to be necessary in order to prevent the spread of a contagious or infectious disease among animals.

Notification (*2*).

G. O. No. 2179-Revenue, 20th September 1919.

In exercise of the powers conferred by section 18 of the Madras Cattle Disease Act, 1866, the Governor in Council is pleased to make the following by-law :—

In any district or part of a district in which the provisions of the Madras Cattle Disease Act, 1866, are put in force, whenever any animal dies of any contagious or infectious disease, its owner, or the person in charge of it, shall give immediate notice of the occurrence to the keeper of the hospital-pound provided for the village or township in which the animal died, and shall see that the carcass is not skinned. The keeper of the hospital-pound shall, as soon as possible, examine the carcass and if he should be of opinion that the animal died of contagious or infectious disease, he shall require the owner or the person in charge to have the carcass either burnt, or buried without skinning at least six feet below the surface of the ground and well covered with quicklime.

Notification (*3*).

G. O. Press No. 1004-Development, 23rd May 1924.

In exercise of the powers conferred by section 18 of the Madras Cattle Disease Act, 1866, the Government of Madras (Ministry of Development) are pleased to make the following by-law :—

In any district or part of a district in which the provisions of the Madras Cattle Disease Act, 1866, are put in force, the District

Magistrate (or, in the City of Madras, the Commissioner of the Corporation) may, if he considers such a course necessary in order to check the spread of Rinderpest where this disease exists, order compulsory inoculation by the " Serum alone " method by the officers of the Civil Veterinary Department.

Such order shall specify the villages or areas to which it applies and be published in such manner as the District Magistrate, or the Commissioner may think fit. The time and place, for the production of animals for inoculation every such village or area shall be published in such village or area in the manner aforesaid and thereupon it shall be the duty of the owner or person in charge of every animal therein to produce such animal for inoculation at the said time and place. G. O. No. 242. Development, 8th February 1929.

NOTE.—Sections 6 and 15 given herein and the words " the Commissioner of the Corporation " for " the President of the Municipal Commission " were substituted by the Madras Cattle Disease Amendment Act, III of 1931.

NOTE ON SUBJECT NO. 18.

MEASURES WHICH SHOULD BE ADOPTED IN INDIA IN ORDER TO COMPLY WITH INTERNATIONAL REQUIREMENTS REGARDING THE EXAMINATION AND CERTIFICATION OF ANIMAL PRODUCTS FOR EXPORT

by

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During recent years, in order to keep their livestock free from diseases that have been eradicated at great cost or to prevent the possible introduction of new diseases, foreign countries are insisting on strict measures being taken to ensure that imported animal products are from disease free or healthy animals and the products must be accompanied by certificates by Veterinary Surgeons appointed by the Government of the exporting country. The certificates vary somewhat from country to country but they all demand that the products are from animals that were free from certain diseases at the time of death.

India has a very large export trade in animal products, particularly in hides and skins and it is evident that if she is to retain this large trade some thing must be done to meet the demands of importing countries, for, owing to the present conditions in India, it is extremely difficult for the certifying authorities to issue the certificates required. The following suggestions are offered :—

(1) All animals slaughtered for human consumption should be slaughtered in public slaughter houses and the animals subjected to anti- and post-mortem examination by a qualified Veterinary Surgeon.

(2) For this examination all local bodies must employ Veterinary Surgeons as Superintendents of slaughter houses.

(3) All animals slaughtered at the slaughter houses must be certified by the Veterinary Surgeon to be free from contagious diseases at the time of slauhgter.

(4) Bales of hides and skins should be marked in some way to indicate their source of origin and date of slaughter.

(5) Weekly information regarding the incidence of diseases throughout India, infected areas and dates from which areas are declared free, should be published for the information of Veterinary Authorities at the ports.

(6) A considerable tightening up of the reporting of outbreaks of contagious diseases among livestock by local reporting officers is required.

(7) The introduction of legislation for the control of contagious diseases of livestock is essential so that outbreaks can be quickly suppressed.

(8) The creation in Provincial and State Veterinary Departments of cadres to deal entirely with the control of contagious diseases instead of utilising the staff in charge of hospitals and dispensaries for this duty.

(9) The creation of a Central Veterinary Service to regulate inter-provincial/state movement of live-stock particularly with reference to the movement of diseases herds and flocks and the transport of animals and animal products over the frontiers of India.

It is not considered that the above is an exhaustive account of the measures required to safeguard India's export trade in animal products. It will however serve to stimulate a thorough discussion on a most important subject and the ways and means by which any measures to be adopted are to be carried out must be carefully considered.

NOTE ON SUBJECT NO. 19.

THE CORRELATION BETWEEN SOIL DEFICIENCEIS, POOR CULTIVATION, UNTHRIFTY CATTLE AND HUMAN MALNUTRITION.

by

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It is scarcely necessary to repeat the well-known fact that the soil is the source and origin of all living things, animal and vegetable on this planet and that in the course of evolution a fine adjustment has been established between the condition of the soil, its organic and inorganic constituents, and the nature and condition of all animals and vegetable organisms which depend on it for their existence. There has thus become established a biological circle of events in which the earth or soil is both the starting and the finishing point for all life in a mundane sense. Stated in the most general terms, a rich and satisfactory soil is one which is able to produce foodstuffs both for human beings and animals, which contain in proper proportion all those substances necessary for healthy animal life.

Such a generalisation, however, requires considerable amplification, because nature in her bounty even on rich and productive soils has evolved such a variety of good stuffs that these in turn require careful selection and adaptation to animal requirements if conditions of health are to be established.

The problem is by no means a simple one as the animal organism is an extremely complicated machine and is only produced and can only work satisfactorily if a large number of intercorrelated chemical and biological requirements are adequately met.

It is natural to expect that if some essential chemical substances are lacking or deficient in a soil that these deficiencies will in turn be reflected in deficient foodstuffs produced from them—and as a result that the harmonious evolution and functioning of animals and human beings dependent on those foodstuffs will be thrown out of gear.

Much research has been conducted on this problem the major facts of which are now well-known to all. Inspite of this, however, we see in the world to day an enormous amount of sickness and ill-health caused directly or indirectly by malnutrition—or in other words by a failure to give effect to that cycle of requirements which may be summarised thus :—a rich soil—satisfactory production of good stuffs—and an adequate quantitative and qualitative selection of these for animal life.

Not all soils are of equal productive capacity, nor are all the products of the soil of equal biological value, so that the adjustment of local availability to requirements must involve in many cases supplementing the former from other sources.

The soils of India comprise a number of very varying types, and the crop which are produced will naturally vary on this account and also with climatic conditions. Similarly the requirements of human beings and animals will vary both in quantity and quality as regards their food—and yet, although

India is primarily an agricultural country the amount of malnutrition and consequent sickness is stupendous. No consideration of the problem before us could be complete without taking into consideration the economic factor. That is, extensive though our knowledge is already of the value of different foods and the requirements of human beings and animals, the one limiting factor for the vast mass of the population is the capacity to obtain them to the extent required for full conditions of health.

It is not proposed in this note to attempt to review the whole subject of soil and food deficiencies, in India but to concentrate on a few of the more salient features and to suggest some means by which further efforts at amelioration can be made.

Some of the most conspicuous, defects of Indian soil are,—a lack of phosphates (notably in Bihar), and lack of calcium chiefly in the hilly and submountain tracts and a lack of organic matter (notably in the Punjab).

While in the Punjab, water can to a great degree make up for humic deficiency, the lack of calcium and phosphorus in the soil is more definitely reflected in the condition of the people and animals.

In southern India again where the main dietary article of the people is rice and other cheap cereals the physical condition of the people is recognised to be inferior to the more northerly races where wheat, dairy produce and meat enters more largely into the diet.

One of the most interesting tracts in India where the problem of soil deficiencies, dietary defects and malnutrition may be seen most clearly is the Kangra district of the Punjab where a very comprehensive survey has recently been made into soil conditions, food requirements and malnutrition and this may be selected as an example for review of what could advantageously be done in other parts of India.

The Kangra valley is one of the most densely populated parts of the Punjab, if not of India. Table 'A' shows the animal and human population data for Kangra in comparison with the dry arid south-eastern Hissar district and the fertile and prosperous Lyallpur district in the Canal Colony of the Punjab.

These figures speak for themselves and indicate the enormous drain there must be on the soil of the district particularly when it is reflected that the rainfall varies from 50 to 120 inches a year.

This high rainfall involves considerable leaching from the soil of soluble minerals, the most conspicuous of which is calcium. It might naturally be expected that this would find reflection in the crops and this in turn in the condition of the people. As Osteomalacia, Goitre etc., and general malnutrition are widespread in Kangra a study of some soil and crop data will prove interesting.

In a paper published in 1931 (some digestibility trials on Indian feeding stuffs, Part VII. Kangra Rice Straw, *Indian Journal of Veterinary Science and Animal Husbandry*, Volume I, part III, September, 1931), I reviewed some of the factors responsible for the poor condition of the cattle in the valley and showed that rice straw the staple feed of the Kangra cattle is deficient in protein, calcium and phosphorus.

Furthermore the average weight of the Kangra cattle is only about 400 lb. and although these animals manage to live on this scanty ration, it proved to be a non-maintenance ration for Montgomery heifers of similar age and weight at Lyallpur when fed *ad lib.*

Nature of soil.—A study of a large number of soil samples from the Kangra valley shows that they vary fron sandy to heavy loams and appear in this respect to be normal.

The chief abnormality found was a predominately low total calcium content from 3 to 6 times lower than that for normal Lyallpur soils, *viz.*, from 1 to 3 per cent. Against this, however, may be offset the exchangeable calcium figures (signifying the more readily available form of this mineral), which in the majority of samples analysed fell within the normal range for Lyallpur soils, *viz.*, 0·1 per cent.—only a very few cases occur chiefly in the sub-soil in which the exchangeable calcium is abnormally low.

The figures for total phosphates in the Kangra soils show considerable variations from 0·128 from highly cultivated land to 0·016 from a typical rice land. The average figure is 0·06 to 0·07 against a normal figure of 0·1 for typical Lyallpur soils. A large number of soils, however, particularly rice lands are conspiciously low in total phosphates, while the figure for available phosphates is invariably lower than 0·06 for a good normal Lyallpur soil.

A remarkable feature of these soils is their *p*H values.

Except in the case of one or two particular localities, *viz.*, Nurpur and Budhwar where the value lies between 7·25—7·75, it is in the majority of cases between 5—6. This shows that these soils are acidic and need the addition of lime for certain crops. The lower *p*H values and the higher nitrogen content compared with soils in the plains are evidently due to the addition of a greater amount of organic matter, naturally or otherwise to the Kangra soils. Table 'B' summarises these data.

Nature of the water.—It is not easy to correlate local manifestations of malnutrition with any recognisable defect in the water, and no data exist which may throw light on the relationship between Iodine deficiency and the widespread prevalence of Goitre.

The general analyses, however, do not show any thing which indicates them to be more unsatisfactory than or inferior in any marked degree to an average canal water. The appended Table 'C' shows comparative data for some Kangra waters, canal waters and some from other sources in the Punjab.

The composition of foodstuffs.—The writer has recorded in a publication (I. C. A. R.'s Miscellaneous Bulletin No. 16. Indian grazing conditions and the mineral contents of some Indian fodders), the analyses of a very large number of fodders and feeding stuffs carried out in and endeavour to correlate the composition of a feeding stuff with the soil on which it is grown. This is a matter of great difficulty and it was pointed out that from the analyses of some hundreds of samples long statistical scrutiny failed to reveal any clear picture of a definite relationship.

In the case of Kangra the analyses of a large number of samples of foodstuffs have again failed to bring out any conspicuous deficiencies in the compostion of locally grown foodstuffs and it has not been possible with the data

available to correlate any particular soil conditions with any abnormal features in composition of foodstuffs grown on the soils. Table 'D' shows the comparative analytical data of a few of the typical foodstuffs from Kangra and corresponding data given in the Public Health Bulletin No. 23 Government of India. It will be noted that the protein figures for the Kangra samples are generally lower than the Conoor figures, but there is no distinct correlation between the calcium and phosphorus figures.

It would appear that within certain limits soil deficiencies and deficiencies in the composition of corresponding foodstuffs do not run parallel. What is very clearly brought out in the Kangra survey, however, is the generally unbalanced and deficient rations of the animals, with the result that they are under-sized and the cows and buffaloes give very little milk—in many cases none at all. This naturally affects the condition of the population, the majority of whom get no dairy produce at all in their diet.

A study of the dietary of a typical family from village Launa near Palampur is instructive and the details are shown in Tables 'E' and 'E'$_1$. It will be noted that the daily average consumption per adult for calcium, phosphorus and protein is respectively 0·268, 1·81 and 61·21 grammes. The recognised standard for comparison is 0·68, 1·00 and 65 grammes.

It will be noted that for this particular family, in which Osteomalacea was conspicuous, the dietary was deficient in calcium, but the phosphorus and proteins are equal to or higher than the standards. Many families showed similar features and without referring to the details from others, it can be stated that whereas some families are getting a ration below normal in total calorific content, the average is up to standard in this respect.

Tables 'F' and 'G' show corresponding data for the Lyallpur Jail rations and those for students of the Agricultural College at Lyallpur.

The chief cause of malnutrition and in particular of Osteomalacea appears to be the fact that the people on the whole are getting a low calcium ration consisting largely of cereals. In the majority of cases the supply of fresh fruit, vegetables and dairy produce is very scanty or entirely absent. This means serious deficiency of most of the essential vitamins particularly 'A' and 'C'.

An interesting fact brought to light is that the blood of these people shows an approximately normal calcium content. Hence Osteomalacea is prevalent probably because the already inadequate calcium which they do get in their food cannot be properly utilised on account of this vitamin deficiency, a condition which is also augmented by the known anti-calcifying substances present in cereals.

Another possible explanation suggested by the Director of Public Health Punjab, is that, due to an insufficient calcium intake, the body draws on the stores in the skeletal frame which becomes progressively depleted and enfeebled while the calcium content in the blood stream remains approximately normal.

The main scientific facts relating to the subject under review as far as Kangra is concerned, appear to be reasonably well-established and may be briefly summarised as follows :—

The chief deficiency in the soil is calcium which is reflected in a deficiency of calcium in the main fodder of the animals, *viz.*, rice straw, in which phos-

phorus and protein are also below normal. The result is a milk supply deficient in quality and quantity to such a degree that most of the people are starved of this article. The diet of the people while adequate, on the whole, quantitatively, is seriously deficient qualitatively, particularly in calcium, phosphorus and vitamins and to a lesser degree in proteins.

A vicious circle is thus set up in which those essential food elements which are actually present in the rations cannot be properly utilised by the organism and widespread malnutrition is the result.

The root origin of the trouble is largely an economic one and the problem is how to improve agricultural practice to such a degree that the people can either supplement their rations locally by the materials they lack, *viz.*, fresh fruits, vegetables and dairy produce, or so improve their economic condition that they can obtain them from elsewhere.

However, when due allowance has been made for the general poverty of the people, there is a considerable residuum of the population in reasonably comfortable circumstances who still show many signs of malnutrition from which they are obviously suffering. This is partly due to ignorance and partly to the difficulty of getting locally the necessary dietary supplements to balance the defects of the rations ready to hand.

While the abovementioned facts relate particularly to a part of the Punjab, evidence is accumulating to shows that the same problem confronts us to a lesser or greater degree in other parts of India where it is becoming evident that there is a very definite correlation between soil deficiency, poor cultivation, unthrifty cattle and human malnutrition. It also appears clear that where soil deficiencies do occur these need not necessarily be the major cause of malnutrition. This latter is rather due to the poverty and subsequent inertia of the people and the lack of those articles of diet which the soil could produce given better methods of husbandry.

Malnutrition is not confined to any social class or group of people, neither is it exclusive to India.

It is, however, extremely widespread in India, particularly among the poor and is undoubtedly responsible for, and the immediately predisposing cause of a large proportion of sickness and disease.

Malnutrition forms one of the major problems of India, in fact *the* major problem if its significance and the extent to which it affects all other aspects of National progress were properly realised.

The solution of the problem is not an easy one, but the first step is to ascertain the facts Province by Province and district by district by properly conducted and co-ordinated surveys. Too much time and labour should not be spent on the accumulation of a vast amount of analytical data, much of which is already available, but after the salient facts have been ascertained attention should be directed mainly to the enlargement and improvement of agricultural activities which will bring within reach of the people those dietary adjuncts which they now lack—and this is a vast problem—and one on which the whole National welfare depends.

TABLE A.

Showing Human and Live-stock population of Kangra, Hissar and Lyallpur.

Per cultivated square mile.

District.	Cultivated area in Square miles.	Human population. (Souls 1931).	Population per square mile.	Live-stock.	Live stock per square mile.
Kangra	1,203	801,312	666	1,335,724	1,110
Hissar	3,958	899,479	228	997,452	252
Lyallpur	2,643	1,151,351	436	1,198,815	458

TABLE B.

Showing the analysis of a few soils (Kangra Nutrition Enquiry), with comparative data for normal Lyallpur soil.

Reg. No.	Date of sampling.	Locality.	Mechanical analysis (per 100 grms. air dried soil).								Chemical analysis (per 100 grms. air-dried soil).								10 per cent. water extract analysis.					pH values (glass electrode).
											Total Hcl Extract.			Exchangeable calcium.	Available 1 per cent. citric acid—extract.		Total solids.	Carbonates. Na_2Co_3	Bicarbonates. $NaHCo_3$	Chlorides NaCl	Sulphates Na_2SO_3	Calcium Ca	Sodium Na	
			Clay.	Silt.	Fine sand.	Sand.	Gravel.	Organic matter.	Total nitrogen.	Calcium Carbonate.	CaO	K_2O_5	P_2O		K_2O	P_2O_5								
1938																								
692	6-7-1938	Nurpur near Forest Rest House. 1′.	22·34	30·78	45·72	1·16	*Nil*	9·84	0·094	*Nil*	1·044	0·304	0·808	0·210	0·014	0·017	0116	*Nil*	0·026	0·020	0·020	0·026	0·005	7·70
693	6-7-1938	Nurpur near Forest Rest House. 2′.	16·66	29·18	50·40	0·66	21·15	0·46	0·046	3·20	3·984	0·640	0·093	0·164	0·008	0·006	0·113	*Nil*	0·067	0·035	0·011	0·020	0·007	7·97
706	5-7-1938	Village Budhwar. 1′ ..	15·34	23·22	37·72	14·47	6·89	0·113	0·113	5·25	3·044	0·718	0·128	0·131	0·017	0·005	0·130	*Nil*	0·076	0·041	0·012	0·023	0·003	7·38
707	5-7-1938	Village Budhwar. 2′ ..	10·90	13·44	24·94	45·02	1·77	0·88	0·066	5·70	3·562	0·380	0·090	0·157	0·013	0·013	0·090	*Nil*	0·042	0·035	0·011	0·013	0·004	7·53
708	5-7-1938	Village Budhwar. 3′ ..	24·20	8·26	44·44	19·35	8·67	9·78	0·053	3·75	3·135	0·244	0·078	0·084	0·012	0·014	0·136	*Nil*	0·092	0·035	0·010	0·022	0·002	7·59
712	7-7-1938	Village Shahpur. 1′ ..	29·30	29·96	38·28	2·46	2·78	0·88	0·056	*Nil*	0·364	0·362	0·087	0·171	0·012	0·00	30·073	*Nil*	0·034	0·026	0·010	0·011	0·022	6·38
713	7-7-1938	Village Shahpur. 12″-18″	36·33	40·31	21·77	1·59	*Nil*	0ff43	0·053	*Nil*	0·263	0·732	0·087	0·172	0·013	0·002	0·064	*Nil*	0·025	0·029	0·010	0·013	0·001	5·90
734	14-7-1938	Village Palampur. 1′ ..	9·84	19·08	40·92	30·16	8·68	1·06	0·066	*Nil*	0·151	0·424	0·048	0·065	0·016	0·003	0·080	*Nil*	0·017	0·053	0·009	0·013	0·003	5·20
735	14-7-1938	Village Palampur. 2′ ..	16·82	17·13	37·23	28·82	10·54	0·43	0·042	*Nil*	0·123	0·416	0·056	0·049	0·012	0·004	0·072	*Nil*	0·017	0·041	0·012	0·010	0·005	5·25
1100	1310-1938	Village Bhanala (Shahpur) 1′.	10·64	19·36	38·25	31·75	12·23	1·62	0·174	*Nil*	0·350	0·490	0·057	0·092	0·013	0·011	0·144	*Nil*	0·059	0·070	0·013	0·012	0·071	5·57
1101	13-10-193	Village Bhanala (Shapur) 2′.	13·02	16·24	34·69	36·07	17·20	1·07	0·076	*Nil*	0·231	0·439	0·046	0·050	0·010	0·019	0·108	*Nil*	0·034	0·070	0·005	0·009	0·011	5·48
1102	13-10-1938	Village Bhanala (Shahpur) 3′.	15·52	16·24	36·47	31·77	22·65	1·03	0·070	*Nil*	0·231	0·464	0·043	0·049	0·140	0·188	0·136	*Nil*	0·042	0·082	0·010	0·010	0·018	5·50
1106	13-10-1938	Village Bahnala (Shahpur) 1′.	27·64	37·88	30·96	3·52	4·30	1·03	0·049	*Nil*	0·371	0·749	0·022	0·234	0·011	0·010	0·142	*Nil*	0·042	0·088	0·011	0·011	0·017	5·99
1107	13-10-1938	Village Bhanala (Shahpur) 2′.	37·70	34·84	26·14	1·20	*Nil*	0·40	0·039	0·08	0·441	0·847	0·016	0·229	0·011	0·014	0·122	*Nil*	0·042	0·070	0·010	0·011	0·012	6·61
1108	13-10-1938	Village Bhanala (Shahpur) 3′.	39·76	33·42	26·24	0·43	*Nil*	0·38	0·049	0·15	0·245	0·952	0·016	0·257	0·012	0·012	0·134	*Nil*	0·049	0·064	0·010	0ff010	0·017	6·61
Normal Lyallpur soil, Agricultural Farm. Sq. 27. 1′			18·78	17·02	46·44	17·64	0·12	0·42	0·061	1·04	1·300	0·800	0·100	0·010	0·029	0·054	0·154	*Nil*	0·076	0·064	0·024	0·022	0·014	7·01

TABLE C.

Showing the analyses of samples of water from Kangra district with comparative data from other places.

(Per 100,000 parts.)

Serial No.	Description.	Date of Receipt.	Total solids.	Carbonates as sodium carbonate.	Bicarbonates Na HCo^3.	Chlorides Nacl.	Sulphates Na^2SO^4.	Calcium $Ca(HCO^3)2$.
1	Well of Badhon—Budhwar Nurpur	9-7-1938	45·52	*Nil*	43·0	1·17	*Nil*	30·4
2	Well of Rina—Budhwar Nurpur ..	9-7-1938	59·70	*Nil*	57·0	1·63	*Nil*	38·6
3	Spring Water—Baij Nath ..	22-7-1938	19·19	*Nil*	17·0	1·40	*Nil*	6·0
4	Spring of Gadis	4-8-1938	5·85	*Nil*	5·0	0·60	*Nil*	3·5
5	Kuhl' (Streamlet) used by Chumar (Launa).	4-8-1938	7·20	*Nil*	6·0	0·50	*Nil*	4·9
6	Chumar's well (Chiliali) ..	26-8-1938	18·55	*Nil*	15·00	0·50	*Nil*	8·9
7	Brahman's well (Chiliali) ..	20-9-1938	14·00	*Nil*	10·50	0·50	*Nil*	8·9
8	Naun Spring of Gorara, Shahpur ..	20-9-1938	13·30	*Nil*	9·00	1·40	*Nil*	11·2
9	Shahpur well near Hospital ..	20-9-1938	48·40	*Nil*	37·00	1·40	*Nil*	33·8
			Comparative data for other places.					
1	Upper Jhelum Canal	..	17·35	*Nil*	17·10	0·47	3·04	9·0
2	Sutlej Valley project	..	35·35	trace	4·20	0·59	3·90	5·0
3	Jhang Agricultural Farm well ..	..	66·01	*Nil*	39·05	6·14	18·97	12·80
4	Tube well Devis Road, Lahore ..	..	44·73	trace	28·55	6·73	9·13	7·5
5	Jandiala trial bore, Amritsar ..	..	46·30	*Nil*	21·01	4·39	20·90	20·12
6	Municipal Tap water, Lyallpur ..	..	13·05	*Nil*	10·92	0·88	trace	5·60

Table D.

Showing comparative data for calcium, phosphorus and protein in a few typical foodstuffs grown in Kangra valley and corresponding data from Conoor given in the Public Health Bulletin No. 23.

Foodstuff.	Ca.%	P.%	Protein.%
Rice	0·007	0·165	8·49*
	0·006	0·122	5·81
Wheat	0·054	0·315	11·77*
	0·051	0·345	10·25
Gram	0·185	0·236	17·08*
	0·250	0·288	16·97
Maize	0·005	0·102	4·33*
	0·021	0·166	1·24
Brinjals	0·024	0·664	1·31*
	0·015	0·035	·08
Ladies finger	0·094	0·078	2·20*
	0·076	0·052	1·62
Pumpkin	0·009	0·030	1·36*
	0·014	0·016	0·50
Banana	0·002	0·045	1·33*
	0·016	0·033	1·23
Snake gourd	0·045	0·024	0·46*
	0·029	0·025	0·53
Cow's Milk	0·120	0·093	..*
	0·100	0·069	..
Buffalo's Milk	0·203	0·125	..*
	0·097	0·046	..

*Figures in these lines have been taken from Public Health Bulletin No. 23, giving Conoor data.

TABLE E.

Average daily consumption of calcium, phosphorus and protein in food (25th April to 13th May 1938) by the family of Minkoo Chumar of village Launa, near Palampur.

Members of the family :—Male 1, age 35 years.

Females 5, ages 30, 9, 8, 5 and 2 years.

Consumption units — 3·6.

Food.	Average consumption per day oz.	Calcium grammes.	Phosphorus grammes.	Protein grammes.
Wheat flour	10·79	0·2422	1·176	29·82
Maize flour	8·57	0·1556	0·818	18·74
Rice	76·05	0·3025	3·428	159·90
Bengal gram (Chiliali figures) ..	1·71	0·1216	0·139	9·09
Lentil (H. B. Figs.)	0·18	0·0065	0·014	1·42
Keon and mint green	0·90	0·0841	0·023	0·85
Phapra Sag	0·77	0·0368	0·011	0·28
Milk	0·29	0·0082	0·006	0·28
Jaggery (H. B. Figs.)	0·29	0·0062	0·003	..
Mustard oil	0·07	..	..	..
Total ..		..	..	..
		0·8637	6·518	220·38
Average daily consumption per adult ..		0·2688	1·81	61·21
Standard requirements per day per adult ..		0·68	1·00	65·0

Table E 1.

This family was given a goat in May.

10,356·3 Calories for the family.

Minkoo chumar of Launa (Depends upon agriculture as labourer).

3,045·9 Calories per adult.

Male = 1, aged 35 years.

Females = 5, aged 30, 9, 8, 5 and 2 years.

Days.	Cereals.			Pulses.		Fats.	Vegetables.		Milk and its products.	Jaggery.
	Wheat *atta*.	Maize *atta*.	Rice.	Bengal gram.	Lentil.	Vegetable oils (mustard oil).	Keon green and mint.	Bhare and phapra *sag*.	Milk.	
	lb. oz.	lb. oz.	lb. oz.		lb. oz.					
25-4-1938	..	2 8	3 8	..	0 2¼	..	..	10¾ oz. (Phaphra) sag).	..	..
26-4-1938	..	..	7 3	..	0 6¾	..	..	..	..	..
2-5-1938	..	..	7 ¼	..	0 4	..	..	..	..	..
3-5-3198	..	2 8	3 8½	4 oz.	..	..	2½ gms. (mint green).	..	..	..
4-5-1938	..	2 8	3 9	1¼ „	..	..	..	..	..	..
5-5-1938	..	..	7 0	5¼ „	..	..	..	..	4 oz.	4 oz.
6-5-1938	..	..	7 0	3½ „	..	..	10 oz. (mint green).	..	..	..
7-5-1938	..	..	7 ½	..	0 7	..	..	..	..	..
8-5-1938	2 13	..	3 8	4 oz.	..	..	..	..	..	..
9-5-1938	2 12	..	3 8	3¼ „	0 3¾	..	..	..	..	..
10-5-1938	2 9	..	3 6½	..	0 6½	1 oz.	..	..	..	..
11-5-1938	2 13	..	3 7	2¾ oz.	..	..	..	..	..	..
12-5-1938	2 5½	..	3 6		0 3½	..	..	..	..	..
13-5-1938	2 7½	..	3 7	..	0 4	..	..	..	..	..

TABLE F.

Showing calcium, phosphorus and protein consumption per head per day in Lyallpur Jail.

Ration.	Quantity in ounces.	Ca. grammes.	P. grammes.	Protein grammes.	Calories.
Gram (parched) ..	4·0	0·2840	0·3272	28·55	341
Wheat flour ..	20·0	0·4055	2·2606	54·70	1,960
Dal	2·5	0·0859	0·3380	16·49	245
Vegetables ..	8·0	0·1999	0·0954	4·95	132
Mustard oil and salt, etc.	0·25	..	..	..	64
Total ..	..	0·9753	3·0212	104·69	2,742

TABLE G.

Showing calcium, phosphorus and protein consumption per head per day by the student of the Agricultural College, Lyallpur.

Community.	Calcium Ca. grammes.	Phosphorus P. grammes.	Protein grammes.	Calories.
Muslims	0·7410	2·1945	64·13	2,748
Sikhs	1·2578	3·0379	85·79	2,687
Hindus	1·0878	2·1697	68·54	2,294

SUPPLEMENTARY NOTE ON SUBJECT No. 19.

by

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From the point of view of the types of cattle, the United Provinces can be divided into 5 definite tracts :—

1. The dry western tract (rainfall 20-30 inches) which includes the area west of the Ganges, stretching from Cawnpore to Saharanpur, including 14 districts which form part of the Agra, Meerut and Allahabad Divisions.

In this tract good types of cattle, sheep and goats are to be found, and the soil and climatic conditions of the tract lend themselves to improvement being effected in the existing types.

2. The Central humid tract (rainfall 30-45 inches) consisting of the highly cultivated areas of parts of the Rohilkhand, Lucknow and Fyzabad Divisions. In this tract only animals of moderate size and mediocre efficiency in draft and milk are produced and better classes of animals, if introduced, tend to degenerate.

3. The Terai tract, situated at the foot of the Himalayas (rainfall 45-65 inches). This tract includes areas where grazing is in abundance, but only small types of draft cattle can be raised. This tract has no cattle or buffaloes of milk type, and better types of cattle degenerate rapidly.

4. The Bundelkhand area of many different soil formations where types vary noticeably with the different types of soils.

5. Hill tracts which can produce only the poorest and smallest types of cattle and where cattle from other tracts tend to rapid degeneration.

Within the above tracts, however, there are to be found some particular areas, which though situated in a tract where generally poor types of cattle are raised, are favoured in some way or other by suitable soil and fodder conditions and are, therefore, able to produce within these circumscribed areas, cattle much superior in type to the general type of the tract.

It is now generally recognised that there is a close relation between the types of soil of a tract, and the types of cattle and other domestics animals that can be raised on it. Cattle are dependent on the fodders and agricultural by-products of the soil on which they are raised. Any deficiencies in the soil must affect in some way or other the composition as well as the quantity of fodder, etc., which it produces, and this must be reflected in the animals bodies which are built up on those fodders and agricultural by-products.

The human population in the villages of a particular tract is largely dependent on the home grown produce of that tract. Any local deficiencies in the soil must necessarily be reflected in the foods consumed, and the growth and health of the people will in consequence be adversely affected. In the United Provinces there are areas which, like the Punjab, produce cattle of excellent type, and also maintain a human population famed for their physique and efficiency. There is thus a close relationship between soil deficiencies, and cattle and human malnutrition. It is obvious that in any plan of animal

or human nutrition research the fundamental importance of elucidating the precise nature of this relationship cannot be over-estimated.

Above, the Province has been divided into 5 tracts. In only one of them namely, the dry western tract can cattle of good type and efficiency be raised on ordinary fodders without special feeding ; but even in this tract experience has shown that the cattle benefit by the additional feeding of mineral salts. In this tract improvement of type can be easily effected if selective breeding is accompanied by improved feeding. But cattle from this tract degenerate if transferred to any of the other tracts. Cattle from the other tracts on the other hand will improve when brought into this tract.

This clearly indicates that the soil contains important factors determining the efficiency in animal production of the fodder and plants which grow upon it. A survey of the soils of these different tracts is necessary to see how they compare and how they differ. Unfortunately it has not so far been possible to undertake this important product. Such an analytical survey coupled with an analytical survey of the fodders and grasses and crops, will show how soil conditions and soil composition are reflected in the composition of the crop and plant it produces. It will only then be possible to tackle effectively and economically the vital problem of cattle and human malnutrition in the Province.

SUPPLEMENTARY NOTE ON SUBJECT No. 19.

THE MINERAL CONTENTS OF SOME NATURAL AND CULTIVATED FODDERS IN TRAVANCORE AND THEIR BEARING ON ANIMAL NUTRITION.

BY

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Director of Agriculture and Fisheries, Travancore.

The problem of mineral deficiencies in the diet of cattle and other farm animals has within recent years assumed considerable prominence, and increasing importance is being attached to the part played by mineral in gredients in animal nutrition. Recent research has revealed that insufficient or improperly balanced mineral matter in the rations of cattle has distinctly harmful effects resulting in defective growth, low production and diseased conditions. Further, it has been shown that mineral deficient diets are directly or indirectly responsible for high mortilaty and complete or partial sterility in cattle. In brief, defective nutrition due to ill-balance or actual deficiencies in the essential mineral ingredients is one of the fundamental causes of deterioration of cattle.

The mineral elements which appear to be most essential in animal nutrition are calcium and phosphorus, both being indispensable for bone formation, milk production and the maintenance of a proper balance between the acid and basic constituents of the body. Young growing cattle in particular have a great craving for these minerals and the lack of an adequate amount of calcium and phosphorus in the diet invariably leads to poor development of bones and connected structures, delayed maturity, reduced milk-yield and diminished fertility. Of the numerous other mineral elements potash, iodine, chlorine and iron have also vital functions to perform in the regulation of metabolism and growth but they are required in much smaller amounts than calcium and phosphorus and the risk of their being deficient in the diet is, therefore, less.

Malabar is notorious for the poor and neglected condition of its cattle, and it does not need much observation to note that cattle in Travancore suffer from many of the ill effects detailed above which are associated with deficiency in the diet of one or more of the essential mineral elements. The deplorable condition of our cattle is by no means surprising as the majority of them are quite uncared for and subsist entirely on natural grazing without any artificial feeding whatsoever. Natural pastures in many parts of the world have been found to be deficient in both calcium and phosphorus, and as there is a marked deficiency in both these minerals in most soils in Travancore it is but reasonable to expect a corresponding deficiency in our natural pastures. In view of the supreme importance of minerals in animal nutrition, a preliminary investigation was undertaken of the mineral composition of some of the pasture grasses in the State to ascertain the extent to which they are deficient in the mineral ele-

ments most essential for proper growth and development of cattle. A summary of the results is given in the following table.

On material at 100°C.

	Ash. %	Line as CaO. %	Phos Acid as P_2O_5. %	Potash as K_2O %
Natural pasture grass, Nagercoil	10·26	0·45	0·37	1·03
Natural pasture grass, Quilon	0818	0·48	0·31	0·90
Natural pasture grass, Vaikom	11·91	0·41	0·33	0·90
Natural pasture grass, Shencottah	14·20	0·95	0·46	1·58
Natural pasture grass, Koni	0·09	0·42	0·34	1·04
Paddy, Straw, Quilon	16·19	0·04	0·04	0·70
Guinea grass (cultivated), Martandam ..	11·71	1·17	0·73	1·83
Napier grass (cultivated), Martandam ..	16·95	0·90	0·65	2·62
British cultivated pasture*	..	1·00	0·74	3·18
British natural pasture* (eaten)	..	0·64	0·76	2·66
British poor pasture* (not eaten)	..	0·30	0·37	1·61

* From Minerals in Pastures' by J. B. Orr.

It is obvious from the data presented above that our uncultivated grasses are distinctly poorer than the British natural pastures on both lime and phosphoric acid. A careful examination of the analytical results reveals that the deficiency in phosphoric acid is particularly marked and that the natural pasture grasses in Travancore generally resemble the ' British poor pasture ' not eaten by cattle. It may be noted that the high lime content of the samples of grass from Shencottah is due to the calcareous nature of the soil. Paddy straw which is largely fed to cattle in Travancore is found to be very deficient in all the essential mineral ingredients. It will also be observed that the cultivated fodder grasses in the State *viz.*, Guinea and Napier grass are much richer than the natural pastures in both lime and phoshoric acid.

A great deal more of data is required before final conclusions can be drawn particularly because the mineral composition of grasses varies widely being dependent on the species, stage of growth soil and manurial conditions, etc. Nevertheless, the results obtained so far merit careful attention and seem to unmistakably indicate that our natural pastures are highly deficient in calcium and phosphorus, the two most essential mineral elements. This is a very important finding and appears to account for the poor condition of our cattle more than any other factor. As stated earlier, the vast majority of Travancore cattle subsist entirely on natural grazing. It is, therefore, needless to point out that these animals receive a mineral deficient diet and prolonged feeding on such pastures diminishes their agricultural worth and ultimately results in serious economic loss.

(C) Constitution.

CONSTITUTION.

LETTER FROM THE GOVERNMENT OF INDIA, DEPARTMENT OF EDUCATION, HEALTH AND LANDS, TO ALL PROVINCIAL GOVERNMENTS AND LOCAL ADMINISTRTAIONS (EXCEPT ANDAMANS), NO. D.-584-VET./38, DATED SIMLA, THE 9TH JULY, 1938, REGARDING BOARD OF AGRICULTURE AND ANIMAL HUSBANDRY—ANIMAL HEALTH AND HUSBANDRY WING—AMENDMENTS IN THE CONSTITUTION OF —.

I am directed to invite attention to paragraph 3 of this Department letter No. 988-Agriculture, dated the 2nd June 1931, laying down the constitution of the Animal Health and Husbandry Wing of the Board of Agriculture and Animal Husbandry and to say that in view of the changes which have since taken place the Government of India have decided to revise the constitution and the Animal Health and Husbandry Wing will in future consist of the following :-

1. Vice-Chairman of the Imperial Council of Agricultural Research, *ex-officio* Chairman of the Board.
2. Expert Advisers of the Imperial Council of Agricultural Research.
3. Secretary of the Imperial Council of Agricultural Research who will be *ex-officio* Secretary to the Board assisted by one or more technical Joint Secretaries appointed for each meeting.
4. Assistant Animal Husbandry Expert and Assistant Agricultural Expert of the Imperial Council of Agricultural Research.
5. Director of Veterinary Services, India (or an officer deputed by him).
6. Director, Imperial Veterinary Research Institute, Mukteswar.
7. Director, Imperial Agricultural Research Institute, New Delhi.
8. Director of Military Farms.
9. Imperial Dairy Expert.
10. Assistant Imperial Dairy Expert.
11. Imperial Agriculturist, New Delhi.
12. Veterinary Research Officer, I/c. Protozoology, Imperial Veterinary Research Institute, Mukteswar.
13. Veterinary Research Officer I/c. Pathology, Imperial Veterinary Research Institute, Mukteswar.
14. Veterinary Research Office I/c. Serology, Imperial Veterinary Research Institute, Mukteswar.
15. Officer in charge Biological Products Section, Imperial Veterinary Research Institute, Izatnagar.
16. Officer in charge, Animal Nutrition Section, Izatnagar.
17. Officer in charge, Poultry Research Section, Izatnagar.
18. All other Class I Officers of the Imperial Veterinary Research Institute.

19. Two Assistant Controllers of Military Dairy Farms.
20. Director of Dairy Research.
21. An Officer working on nutrition problems nominated by the Indian Research Fund Association.
22. An Officer nominated by the President, Forest Research Institute, Dehra Dun, for consideration of grazing problems.
23. One representative of the National Horse Breeding and Show Society of India.
24. Principal Allahabad, Agricultural Institute, Allahabad.
25. Two-Co-operative representatives connected with Animal Husbandry to be appointed by the Chairman.
26. Director of Veterinary Services or representatives of the Veterinary Departments of Hyderabad, Mysore, Baroda, Kashmir, Gwalior, Patiala, Travancore, Cochin, Bhopal and Indore.
27. Two additional representatives each, either official or otherwise, from the States of Hyderabad, and Mysore and one each from the States of Baroda, Kashmir, Travancore, Cochin and Bhopal.
28. Three Veterinary Officers from each Governor's Provinces (except the Punjab and four Veterinary Officers from the Punjab*).
29. One Veterinary Officer each from Baluchistan and Ajmer-Merwara (if and when appointed).
30. Two Agricultural Officer connected with animal husbandry work from each Governor's Province (except the Punjab and one Agricultural Officer from the Punjab).*
31. One non-official interested in animal husbandry to be nominated by each Governor's Province.
32. Two University representatives connected with biological science to be nominated by the Inter-University Board.
33. Such other members as may be nominated by the Chairman.

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* As amended subsequently.

M27ICAR(EHL)—750—13-4-40—GIPS