

UNIVERSAL
LIBRARY

OU_148603

UNIVERSAL
LIBRARY

SIXTY YEARS OF PANJAB FOOD PRICES

1861—1920

A STATISTICAL SURVEY

SOURCE & SCOPE OF THE DATA

A—Area

The source of the data dealt with in this Inquiry has been the series of volumes published by the Government of India and entitled "Prices and Wages in India."

A fortnightly return of retail prices for the commoner food grains and salt in each District throughout India was instituted by Order of the Government of India in 1872, and these returns have since 1873 been regularly published in the *Supplement* to the Gazette of India.

Prior to 1873 records of the prices of food grains and salt had for a number of years been officially collected in some of the Provinces of India ; but the methods of collection were not uniform, nor had the statistics been brought together in a readily accessible form. In the Panjab these figures date back to 1861.

The District returns of retail prices instituted by Order of the Government of India in 1872 are in most Provinces supplied by district officers to the Director of Agriculture and Land Records. They are, in every case, the prices in the Headquarters of the District, and are quoted in seers and chittakhs, or seers and fractions of a seer per rupee.

The first attempt to compile these figures for the whole of India was made in 1878 when a small volume was published by the

Government of India giving yearly average prices for food grains and salt for the period 1861 to 1876 in certain Districts in India which were selected as typical. In the case of the Panjab, the Districts which figure in this volume are Delhi, Ludhiana, Amritsar, Rawalpindi, Multan and Peshawar. The figures in this volume were revised in the next publication in 1884, and prices in the selected Districts were added for the intervening period, 1876 to 1883. Since that date the record of prices has been published annually in the volume entitled "Prices and Wages in India" (1).

From the standpoint of the student it is fortunate that in the Seventh Issue of the Volume (1890) the method of recording prices for selected typical Districts only was abandoned. In that Volume, 127 new Districts were added for the whole of India, and the number for which figures were published for the Panjab and the North-West Frontier Province increased from six to sixteen. What is still more fortunate is that wherever the figures were available for the Districts added they were carried back to 1861. In the case of the Panjab the prices of certain commodities for the Districts now added had always been available since 1861, but in the first six volumes only the prices of the six typical Districts referred to above had been published. Another improvement introduced in this Issue (1890) was the grouping together of Districts of similar climatic character and rainfall (2).

In the Thirteenth Issue (1896), without any reference being made to the change, as far as we can see, a re-grouping of Districts took place for the Panjab. A completely new Group, the South-Eastern, was introduced, and Delhi, Rohtak and Karnal disappeared from the Central Group and came into the South-Eastern; Ferozepore was added to the Southern Group; Jhelum to the Central; Sialkot disappeared from the North-Western and found a place in the Sub-Montane, to which also Jullundur was added. The revised

(1) Now discontinued on the score of retrenchment.

(2) Grouping of Districts in the Panjab introduced in 1890.

<i>Southern.</i>	<i>Central.</i>	<i>Sub-Montane.</i>	<i>North-Western.</i>	<i>Western.</i>
Hissar.	Delhi.	Ambala.	Sialkot.	Shahpur.
	Rohtak.	Ludhiana.	Rawalpindi.	Jhang.
	Karnal.	Hoshiarpur.	Peshawar.	Multan.
	Lahore.	Amritsar.		Dera Ismail Khan.

grouping is shown below⁽¹⁾. Fortunately again, in the case of the Districts added, the figures for a number of commodities were carried back to 1861.

In 1905, two new Districts were added to the list in the Panjab. In that year Attock appears for the first time in the Northern Group and Lyallpur in the Western. As these new Districts had been carved out of older Districts, it was in this case impossible to carry the figures back. Kurram was added to the Northern Group in 1907, and Tochi in the same year to the Western Group and here again figures for the earlier years were not added⁽²⁾.

To sum up as regards area, we have in "Prices and Wages in India" for the years 1861 to 1904 records of retail prices deduced from the fortnightly returns for 19 Districts; for 1905 and 1906 similar records of 21 Districts; and from 1907 to date the records of 23 Districts⁽³⁾. Four of the latter are in the North West Frontier Province which is included with the Panjab in "Prices and Wages in India."

B—Commodities

The commodities for which we have information from 1861 onwards for the Panjab and North West Frontier Province in "Prices and Wages in India" are rice, wheat, barley, bajra, jowar, gram, maize⁽⁴⁾ and salt. From 1886 onwards there are records for marua or ragi, kangan and arhar dal.

(1) Grouping of Districts in the Panjab introduced in 1896.

<i>Southern.</i>	<i>Central.</i>	<i>South-Eastern.</i>	<i>Sub-Montane.</i>	<i>Northern.</i>	<i>Western.</i>
Hissar.	Lahore.	Delhi.	Ambala.	Rawal-	Shahpur.
Ferozepore	Jhelum.	Rohtak.	Ludhiana.	pindi.	Jhang.
		Karnal.	Jullundur.	Peshawar.	Multan.
			Hoshiarpur.		Dera Ismail
			Amritsar.		Khan.
			Sialkot.		

(2) Grouping of Districts in the Panjab since 1907.

<i>Southern.</i>	<i>Central.</i>	<i>South-Eastern.</i>	<i>Sub-Montane.</i>	<i>Northern.</i>	<i>Western.</i>
Hissar.	Lahore.	Delhi.	Ambala.	Rawal-	Shahpur.
Ferozepore.	Jhelum.	Rohtak.	Ludhiana.	pindi.	Jhang.
		Karnal.	Jullundur.	Peshawar.	Multan.
			Hoshiarpur.	Attock.	Dera Ismail
			Amritsar.	Kurram.	Khan
			Sialkot.		Lyallpur.
					Tochi.

(3) The most accurate comparative survey, therefore, that could be made from these figures would be that which took into account the 19 Districts for which figures are available from 1861 onwards. In other words, Attock and Lyallpur should be deleted from 1905, and Kurram and Tochi from 1907, and the figures for the remainder, in which records are available over sixty years, averaged.

(4) The records for maize are very incomplete from 1861 to 1870, entirely wanting from 1871 to 1883, and only from 1886 are they at all complete.

Averages are given for each year for each commodity, for each of the six Groups⁽¹⁾ and for the Panjab (including four districts in the North West Frontier Province) taken as a whole. The average in each case is a simple arithmetical average, and no attempt is made to "weight" according to the population of the Districts in the Group. So in the case of the Province as a whole, the figure given is from 1861 to 1904 the arithmetical average of the prices in 19 Districts; in 1905 and 1906 it is similarly constructed from the prices in 21 Districts; and from 1907 to date it is deduced from 23 entries. This method is obviously defective in that a rise of 100 per cent. in food prices in a sparsely populated District such as Multan exercises the same influence on the general average as a rise of the same amount in a densely inhabited District such as Jullundur, though the latter may cause distress to a much larger number than the former. On the other hand, it must be remembered, as Bowley has pointed out⁽²⁾, that the reliability of an average is much more dependent upon accuracy in the original figures than upon the system of weighting adopted. If we consider the shortcomings of the original returns of District prices, it is most doubtful whether the "unweighted" system adopted could be improved upon.

The method of presenting retail prices in "Prices and Wages in India" was completely altered in 1907. Prior to that date the prevalent Indian method had been followed, and prices were expressed as seers and fractions of a seer per rupee. In 1907, for the sake of comparison of retail prices with wholesale prices, which had come to figure more prominently in later volumes than they did in the earlier issues, the system was changed, and retail prices have since that date been expressed as rupees and decimals of a rupee per maund. The price of produce is now expressed in terms of rupees, not the price of a rupee in terms of produce as before.

In any survey of prices from 1861 to date, it becomes necessary, therefore, to adopt a common notation. What has been done in the present survey is to convert the prices of the earlier period, seers and decimals of a seer per rupee, into rupees and decimals of a rupee per maund. This is the normal method of making statements

(1) Vide Footnote (2), page 3.

(2) Vide Bowley's "Elements of Statistics", Page 118.

of prices—to take the quantity as fixed and the price paid as the variable, rather than the converse method of taking the price as fixed and the quantity obtained as the variable. On the other hand, a strong case could be made out in India for taking the price as fixed and the quantity as the variable in that, in the case of retail prices, it is the method which universally prevails throughout the country⁽¹⁾.

THE SELECTION OF A BASE FOR PURPOSES OF COMPARISON

As is well known to all students of Indian conditions, food prices in India—and in this respect the Panjab has been no exception—were in the past subject to extreme fluctuations, and even now show considerable oscillations. Thus, if wheat be taken as typical, its average retail price in the Province which was Rs. 2·294 in 1861 had fallen to Rs. 1·336 in 1863; in 1869, a year of famine, it stood as high as Rs. 3·380; by 1875 it had fallen to half that figure and fell still lower in the next year, only to rise to over Rs. 3 in 1879. In 1904 the price stood at Rs. 2·264 or lower than it had been in 1861; in 1908, it had risen to Rs. 4·189, and in 1919 it touched Rs. 6·136—the record figure up to that date. Had gram been taken instead of wheat, the fluctuations to be noted would have been even greater. (Vide p. 25).

If prices subject to such fluctuations are to be reduced to percentages for the purposes of comparison, the selection of an appropriate base is of the greatest importance. The writer desirous of showing a particular result can, within reason, do so simply by the selection of the base. Thus wheat prices in 1919 were about $4\frac{1}{2}$ times as high as those of 1863; but rather less than twice what they had been in 1869, only the latter year was one of famine. In this respect there is much to be said for the selection of the year 1873 as the base for in that year the currency troubles—(with their consequent effect upon prices)—which culminated in 1893 in the closure of the mints to the free coinage of silver, had hardly developed to the extent

(1) It may be pointed out that it is not altogether a matter of indifference which notation is adopted. Not only do money prices vary inversely with quantity prices, but the percentage rise and fall varies in the two notations. Thus, if wheat is selling at 10 seers to the rupee, and it falls to 5 seers to the rupee, this is equivalent to a rise in the money price of 100 per cent.; in other words, the price rises from Rs. 4 to Rs. 8 per maund. But if wheat becomes cheaper, if the number of seers for one rupee increases from 10 to 20, *i. e.*, by 100 per cent. the corresponding money price is only 50 per cent. lower; in other words, wheat has fallen from Rs. 4 to Rs. 2 per maund.

of influencing prices. So far as Panjab food prices, however, are concerned, the year 1873 is not particularly suitable. True, it is a year of neither very high, nor very low prices. But in the dozen years which preceded it, on only four occasions did wheat prices in the Panjab fall below those of 1873, while in the other eight years they were higher. In the succeeding twenty years, wheat prices were above the prices of this year on thirteen occasions, and below them on seven; on only one occasion after 1894 do they fall to so low a figure. The selection of such a year as the basis of comparison would thus be somewhat misleading unless its peculiar position were fully realised. It would have to be pointed out that 1873 was a most favourable year, and, therefore, prices expressed as percentages of the price in that year would represent the rise as being greater than it would appear if the average price in the years around 1873 had been taken as the base.

To indicate the difference in the general impression obtained by taking at random different years from the decennium 1861-70 as the base, three tables are set out below.

RETAIL WHEAT PRICES IN THE PANJAB

Table I.	Table II.	Table III.
<i>Base-1861.</i>	<i>Base-1865.</i>	<i>Base-1869.</i>
1861 - 100	1865 - 100	1869 - 100
1871 - 83	1875 - 89	1879 - 93
1881 - 101	1885 - 88	1889 - 61
1891 - 113	1895 - 115	1899 - 76
1901 - 115	1905 - 145	1909 - 118
1911 - 125	1915 - 247	1919 - 183

If all that were presented were Table I, the casual observer might be led to believe that over 50 years prices had shown remarkably little fluctuation. If, on the other hand, only Table II were submitted, it would appear that, after thirty years of comparatively stable prices, the present century had witnessed an enormous increase. Table III, on the other hand, conveys still a different impression in that the prices in 1919, an exceptionally dear year, appear only 83 per cent. higher than those of 50 years before, but the year taken as the base in this case was one of famine. We are not trying to prove any particular variation in prices by the Tables set forth above, but simply to show the great differences in the

general impression conveyed if different years are selected as the base.

All must acknowledge the inadequacy of the method which selects prices in a single year as the base. For purposes of comparison the base must be wider. If, in the case of wheat in the Panjab, we select a triennial period, it will be found that the results are little more satisfactory. Take two triennia, one at the beginning and one at the end of the decennium 1861-70, and the greatest divergence is found in the results as is shown below.

RETAIL WHEAT PRICES IN THE PANJAB

Table IV.

Base. Average yearly prices
in the triennium 1862-64.

1862-64 - 100
1872-74 - 129
1882-84 - 124
1892-94 - 165
1902-04 - 169
1912-14 - 248

Table V.

Base. Average yearly prices
in the triennium 1868-70.

1868-70 - 100
1878-80 - 100
1888-90 - 82
1898-00 - 100
1908-10 - 135
1918-20 - 202

Unless the peculiar position of the two basal periods is clearly realised, it might be thought that in some way or other the lower figures of Table IV had been transposed into Table V, and vice versa. Think of the coin that might be made out of the figures in Table IV by the unscientific exponent! Prices in 1912 to 1914 were already 148 per cent. above what they had been in the triennium 1862-64, and we could hardly contradict him if he went on and declared that the great rise in prices with which we have recently been so familiar had in 1914 little more than begun. An opponent on the same platform might put forth the figures in Table V, and would really deserve equal attention if he demonstrated that prices in the exceptionally dear years 1918 to 1920 were only a little more than double what they had been in the triennium 50 years previously. The figures of both are above reproach, and all that can be said against either is that, with figures subject to such fluctuation as those representing Panjab food prices, the triennium is too short a period to be taken as the basis of comparison. Prices in the triennium 1862-64 were exceptionally low, while those of 1868-70 were exceptionally high; neither is suitable for being taken as the base; but it becomes obvious that when men are out to prove any

particular case they can do so easily by manipulation, and by leaving out the essential qualifications.

Bowley, in his "Elements of Statistics,"⁽¹⁾ has pointed out an extremely good instance of the weakness of a quinquennial average when the interval between recurring maxima is longer than five years. That in the case of Panjab food prices even a five-yearly average may give essentially dissimilar results is shown below where the retail prices of wheat in the Panjab are expressed as percentages of their price in two quinquennia selected from the decennium 1861-70.

Table VI.

<i>Base.</i>	Average of yearly prices from 1862-66.
	1862-66 - 100
	1872-76 - 110
	1882-86 - 114
	1892-96 - 155
	1902-06 - 159
	1912-16 - 239

Table VII.

<i>Base.</i>	Average of yearly prices from 1866-70.
	1866-70 - 100
	1876-80 - 97
	1886-90 - 97
	1896-00 - 128
	1906-10 - 140
	1916-20 - 208.

Each of the Tables is perfectly correct as it stands, but the weakness of the quinquennium is well brought out by the fact that the rise in prices in the quinquennium 1912-16 is shown to be 139 per cent., whereas the rise in the quinquennium 1916-20 when prices were very much higher is only 108 per cent. It would obviously be impossible, or at least most misleading, to take either of these Tables as the basis for a careful scrutiny of the general level of Panjab food prices

The Tables which have been presented so far have been given with the idea of showing the necessity of carefully scrutinising percentages with reference to the base selected. If properly explained and qualified, they may serve a useful purpose; but the person desirous of applying them to any particular problem must always be on his guard. The non-observance of this precaution cannot be better illus-

(1) Vide Bowley, "Elements of Statistics", pp. 151-153.

trated than by an example familiar to most Panjab readers. In an Essay entitled "A General View of Indian Prices"⁽¹⁾, Professor Brij Narain gives two sets of Index Numbers of Prices in India⁽²⁾. The first has reference to Wholesale Prices—(this is definitely stated)—but there is nothing to indicate from whence it has been obtained, nor how it has been constructed. We are left completely in the dark as to whether it is an Index Number constructed by the writer himself, or borrowed from elsewhere⁽³⁾. The second lacks even the defective explanation given with the first. Both are compared with Sauerbeck's Index Number for the United Kingdom, and it would be natural to assume that things which are comparable with the same thing are comparable with one another—(but of this more anon). All we want to affirm here is that figures quoted apart from their context lose much of their value.

The method of treatment also does not seem to us above reproach. In one of the Tables given⁽⁴⁾ an attempt is made to establish a comparison between the rise of prices in India and in certain other countries. In the case of the latter, the year 1896 is selected as the base, but as that was a year of extremely high prices in India, it is passed over in favour of the year 1894 which is taken as the base, and its price is set down opposite 1896 as 100. After what has been said before on the necessity of the greatest care being taken in the selection of the base if the figures are not to give altogether misleading results, the reader will almost be prepared to admit that the general impression conveyed by figures so handled may be correct, but it is just as likely to be wrong.

The Table in question is reproduced in the first six columns below. Two columns have been added. Column 7 gives the writer's second Index Number of Prices in India, and in Column 8 the figures of Column 7 have been expressed as a percentage of the price in 1894⁽⁵⁾.

(1) *Vide* Professor Brij Narain, "Essays in Indian Economic Problems", p. 35.

(2) *Ibid.* pp. 41 and 51.

(3) We surmise that it has been adapted from the Table given by Datta in his "Enquiry into the Rise of Prices in India", Vol. I, p. 48.

(4) *Ibid.* p. 42.

(5) This procedure is not altogether justifiable from a statistical standpoint, but we have reason to believe that the figures in Column 6 have been arrived at in this identical fashion.

TABLE VIII.

Year	United Kingdom (Sauerbeck)	France	Germany	U.S.A	India	The writer's Second Index Number of Prices in India	The figures in the previous Column re- duced to a percentage of their price in 1894
1	2	3	4	5	6	7	8
1894	..	..	..	..	1894	102	100
1895	..	..	..	..	=	104	102
1896	100	100	100	100	100	110	108
1897	101	102	103	99	141	113	111
1898	104	107	109	104	128	96	94
1899	111	116	114	112	127	96	94
1900	122	125	122	122	148	116	114
1901	115	118	117	120	141	110	108
1902	113	115	114	125	135	105	103
1903	113	118	121	126	130	99	97
1904	115	116	122	125	129	101	99
1905	118	118	125	128	141	110	108
1906	126	129	136	135	158	129	127
1907	131	136	146	144	162	137	134
1908	119	124	132	135	173	138	135
1909	121	126	137	140	162	124	122
1910	128	132	141	146	161	122	120
1911	131	141	154	142	164	129	127
1912	138	..	..	151	173	137	134

As a result of such a treatment, can it be said that in 1911 "the percentage rise was for India 64, Germany 54, U. S. A. 42, France 48 and England 31" (1); or that "the rise in Indian prices was greater than in any other country of the world" (2)? Let the reader compare carefully the figures in Columns 2 to 6, and he is likely to

(1) Ibid. p. 42.

(2) Ibid. p. 40.

have a lingering suspicion that the results in Column 6 are vitiated by the selection of 1894 as the base. We have already referred to the writer's second Index Number of Indian Prices. It is a matter of some surprise that when it is handled as he has done his first Index Number—and why should we not do so when both are given without reference and qualification?—the rise of prices in India, far from being "greater than in any other country of the world" is actually found to be less than in any of the other countries selected for purposes of comparison!

THE BASE SELECTED IN THIS SURVEY

One thing then is clear, that, whether we are dealing with Panjab food prices, or with any other prices, the greatest possible care must be taken to see that the base chosen represents a typical period. Had we a well defined interval between points of recurring maxima, this would be easy. But Panjab food prices, whilst exhibiting a certain amount of periodicity, do not, if taken year by year, present any well defined interval. If, however, instead of taking yearly averages, we take the average of the prices in one year with those of the two years preceding and the two years following, so as to cut out violent yearly fluctuations, a fairly noticeable rhythmic movement becomes apparent, (vide Table XII pp. 40-42). So far as any generalisation can be made, it would seem to be that, in the case of Panjab food prices, the tendency has been for eras of high prices and of low prices to follow one another at intervals of about ten years.

On this account it has been thought advisable to take for the purposes of the base the average prices in a decennium. If the cycle has a tendency to run its course in about ten years, no sounder base can be taken. We need not be unduly perturbed if in the period there is a year of great scarcity, for the myth which regarded recurring periods of severe scarcity in earlier Indian history as something very exceptional, as coming more or less within the same category as the Black Death in England in the fourteenth century, has been pretty effectively disposed of⁽¹⁾.

After much consideration, average prices in the decennium 1873-82 have been selected as the base. In that period there were four years of high prices centring round the famine of 1879, and six

(1) See in this connection, Loveday: "Indian Famines"; Moreland: "From Akbar to Aurangzeb", chap. VII; and Morison: "The Economic Transition in India", chap. V.

years of comparatively low prices. Although about this time the price of silver began to fall upon the London market as a result of its demonetization by some of what had been the great silver-using countries, there had hardly been time for the effect to be reflected on the general level of Indian prices. The average price of wheat in the Panjab in this decennium was some 2 per cent. lower than the average price in the decennium 1863-72, and some 5 per cent. higher than in the decennium 1883-92. The average price of gram was also 2 per cent. lower than it had been in the preceding decennium, and about $\frac{1}{2}$ per cent. higher than in the succeeding decennium.

AVERAGE ANNUAL PRICES OF FOOD-GRAINS IN THE PANJAB

Two Tables have been prepared showing the average yearly prices of the principal food-grains in the Panjab—including four Districts of the North-West Frontier Province. In Table IX, the average yearly prices are expressed in Rupees and decimals of a Rupee per maund. Figures are given for Rice, Wheat, Barley, Bajra, Jowar, Gram and Salt from 1861 to 1920; and for Marua, Kangni, Maize and Arhar Dal from 1886—(though a few figures are available for Maize before that date). The attention of the reader is particularly directed to the Notes to Table IX in which the scope and the limitations of the different figures are pointed out.

Table X shows the prices of the above Food-Grains and Salt expressed as a percentage of their average price from 1873 to 1882. Two additional columns have been added. The first of these gives the average percentage for the year for rice, wheat, barley, bajra, jowar and gram. The inclusion of salt, an important article of diet, would obviously not be justifiable in that its price is determined by influences entirely different from those which affect the food-grains. Even the inclusion of rice is doubtful. A glance through the Table will show that though its price does feel the influences which affect the other food grains, it feels them to a very much slighter extent. Accordingly in the second additional column, rice has been omitted, and the figure given there is the arithmetical average of the percentage prices of wheat, barley, bajra, jowar and gram.

One point, however, demands attention in the case of both the Tables. It has already been noted that in the earlier Issues of "Prices and Wages in India" prices were quoted in terms of seers

and decimals of a seer to a rupee. From 1907 onwards the other notation has been used. From 1883 to 1905, I have unearthed the prices quoted in both notations. When the one is converted to the other, we seldom get exact agreement. In most cases, the figures expressed in rupees and decimals of a rupee per maund are a trifle higher than those deduced from the records quoted in seers and decimals of a seer per rupee. To prevent this from exercising any influence upon the result, the mean difference between the price as given in rupees and decimals of a rupee per maund and that calculated from the quotation in seers and decimals of a seer per rupee has been taken for the 12 years following 1882. This correction has been carried back to all the years before 1883. The figures, therefore, from 1861 to 1882 are in every case adjusted, and the amount of the adjustment—generally so small that it might have been neglected—is in each case stated in the Notes to Table IX.

The effect of the inclusion of Attock and Lyallpur in 1905, and Kurram and Tochi in 1907, upon the percentage has been fully considered, and a percentage has been constructed with these districts deleted. These figures are in each case entered within brackets. The general effect of the inclusion of these districts has been to lower the percentage as compared with what it would have been had the 19 districts only been considered throughout. The effect on the individual commodities is shown below; the number of occasions where the percentage with the new districts included is greater than with them excluded is shown +, where less -, where equal =.

	+	=	-
Rice	7	4	11
Wheat	1	4	11
Barley	1	1	14
Bajra	2	5	9
Jowar	4	9	3
Gram	15	1	1

In the case of rice, wheat, barley and bajra, the effect of the inclusion of the new Districts has been to lower the percentage; in the case of jowar it would appear to have had little effect; while in the case of gram the effect has been to raise the percentage. The explanation of the rise in the case of gram would appear to be the inclusion of Kurram where the price of gram is always high. In Attock the price of gram conforms fairly closely to the average for the Province, and in the case of Lyallpur it is generally below the average level.

TABLE IX

AVERAGE ANNUAL PRICES IN THE PANJAB EXPRESSED

Year	Rice †	Wheat †	Barley †	Bajra §	Jowar §
	(1)	(2)	(3)	(4)	(5)
1861	3'534	2'314	1'622	1'783	1'837
2	2'972	1'505	0'904	1'271	1'127
3	2'645	1'356	0'837	1'081	0'945
4	3'138	1'475	0'961	1'405	1'231
5	3'754	1'859	1'170	1'556	1'405
6	3'818	1'773	1'141	1'640	1'393
7	3'553	1'920	1'386	1'734	1'529
8	4'075	2'482	1'718	2'459	2'275
9	4'892	3'350	2'241	3'040	2'599
1870	4'286	2'550	1'723	2'085	1'715
1	4'075	1'920	1'272	1'788	1'396
2	3'840	1'983	1'354	1'803	1'728
3	3'516	1'823	1'217	1'455	1'346
4	3'754	1'763	1'212	1'644	1'477
5	3'516	1'633	1'148	1'408	1'333
6	3'423	1'563	1'060	1'323	1'233
7	3'592	1'736	1'112	1'439	1'310
8	5'040	2'510	1'687	2'646	2'426
9	4'781	3'113	2'233	2'657	2'569
1880	4'892	2'768	1'863	2'265	1'913
1	4'101	2'331	1'540	2'147	1'832
2	3'672	1'893	1'194	1'685	1'354
3	3'607	1'825	1'136	1'393	1'176
4	3'655	1'679	1'146	1'468	1'260
5	3'489	1'625	1'057	1'340	1'206
6	3'634	2'072	1'251	1'859	1'618
7	3'740	2'743	1'883	2'532	2'308
8	3'905	2'580	1'866	2'429	2'072
9	3'954	2'054	1'343	2'005	1'575
1890	3'816	2'210	1'487	1'900	1'687
1	4'095	2'691	1'797	2'469	2'282
2	4'311	2'964	1'941	2'546	2'089
3	4'354	2'457	1'533	2'062	1'683
4	3'906	1'674	1'039	1'733	1'283
5	3'724	2'108	1'407	1'981	1'651
6	4'243	3'175	2'433	3'174	2'725
7	5'449	3'849	2'971	3'882	3'417
8	4'196	2'459	1'580	2'053	1'834
9	3'874	2'548	1'817	2'358	2'056
1900	4'683	3'349	2'660	3'375	3'238

(Continued on

TABLE IX

IN RUPEES AND DECIMALS OF A RUPEE PER MAUND

Gram *	Marua ‡	Kangni †	Maize β	Arhar Dal **	Salt †
(6)	(7)	(8)	(9)	(10)	(11)
2'052					3'244
1'209					3'422
1'994					3'527
1'171					3'686
1'351					3'795
1'351					3'795
1'697					3'970
2'147					3'777
3'658					3'852
2'435					3'832
1'808					2'611
1'009					3'638
1'468					3'929
1'266					3'740
1'271					3'777
1'111					3'451
1'278					3'097
2'482					3'097
2'685					3'393
2'227					3'322
1'915					3'795
1'502					2'736
1'323					2'667
1'267			1'291		2'688
1'248			1'219		2'660
1'409	1'792	2'111	1'605	2'102	2'661
1'927	2'341	2'597	2'264	2'569	2'623
1'979	2'273	2'314	2'272	2'613	2'989
1'584	1'928	2'111	1'642	2'548	3'048
1'797	1'913	2'113	1'683	2'540	3'019
2'033	2'055	2'532	2'330	3'137	3'031
1'997	2'209	2'748	2'231	3'227	3'066
1'576	2'089	2'686	2'128	3'048	3'095
1'176	1'485	2'218	1'206	2'898	3'622
1'603	1'942	2'465	1'682	3'103	3'058
2'573	2'429	3'137	2'569	3'324	3'070
3'829	3'420	3'807	3'393	4'943	3'176
2'107	1'689	2'747	1'733	4'567	3'206
2'318	1'927	2'584	1'824	3'822	3'172
3'465	2'483	3'313	2'888	4'523	3'165

next page)

TABLE IX—(continued)

Year.	Rice †	Wheat †	Barley †	Bajra §	Jowar §
	(1)	(2)	(3)	(4)	(5)
1901	4'354	2'648	1'699	2'004	1'848
2	4'290	2'523	1'805	2'265	1'867
3	4'180	2'451	1'765	2'143	1'835
4	4'028	2'264	1'467	1'733	1'396
5	4'274	2'666	1'698	2'187	1'873
6	4'628	2'730	1'968	2'849	2'507
7	5'238	2'903	1'965	2'338	2'147
8	6'492	4'189	2'987	3'790	3'515
9	5'705	3'942	2'401	2'801	2'588
1910	5'215	3'118	1'878	2'486	2'288
1	5'219	2'882	1'942	2'542	2'240
2	5'510	3'283	2'507	3'228	2'984
3	5'590	3'514	2'512	3'173	2'593
4	5'785	3'820	2'731	3'579	3'264
5	6'083	4'545	2'904	3'915	3'754
6	5'888	3'895	2'962	3'676	3'136
7	5'607	4'193	2'899	3'068	3'175
8	7'250	5'068	3'546	4'785	5'561
9	9'609	6'136	4'463	7'141	6'100
1920	9'454	5'620	3'836	5'490	4'630

NOTES ON TABLE IX

† Rice, Wheat, Barley, Salt.

Prices from 1861 to 1904 are deduced from the records of 19 Districts; for 1905 and 1906 of 21 Districts; and for 1907 to date of 23 Districts.

Rice figures from 1861 to 1882 are higher than the calculated by Rs. 0'075

Wheat.....Rs. 0'020

Barley.....Rs. 0'019

Salt.....Rs. 0'373

§ Bajra & Jowar.

Prices from 1861 to 1904 are the average of 19 Districts; from 1905 to date the average of 21 Districts (Kurram and Tochi not being added in this case in 1907).

Bajra figures from 1861 to 1882 are higher than the calculated by Rs. 0'035

Jowar.....Rs. 0'029

TABLE IX—(continued)

Gram *	Marua ‡	Kangni **	Maize	Arhar Dal *.*	Salt †
(6)	(7)	(8)	(9)	(10)	(11)
2'206	1'806	2'636	1'908	4'271	3'173
2'120	1'735	2'653	1'779	3'900	3'164
1'912	1'576	2'577	1'801	3'790	2'806
1'539	1'435	2'487	1'419	3'786	2'746
1'949	1'645	2'802	1'799	4'052	2'310
2'358	1'776	3'218	2'351	4'537	2'318
2'447	1'838	3'076	2'103	5'243	1'816
3'888	2'784	3'870	3'183	6'187	1'721
2'950	2'637	3'263	2'707	5'670	1'703
2'201	2'667	3'190	2'093	4'255	1'704
2'134	2'421	3'033	2'039	4'027	1'688
2'608	2'227	3'847	2'606	4'023	1'693
2'782	2'353	3'650	2'579	4'342	1'680
3'416	2'248	3'353	3'104	5'385	1'712
3'418	2'787	3'860	3'724	6'550	1'747
3'301	3'132	4'242	2'788	6'096	2'311
3'432	2'823	3'749	3'019	5'286	2'699
4'055	2'888	4'507	4'161	6'033	3'570
5'696	4'377	7'168	4'743	10'296	3'572
5'560	4'391	6'681	4'470	10'865	3'388

NOTES ON TABLE IX

* Gram.

Prices from 1861 to 1904 are the average of 19 Districts; for 1905 and 1906 of 21 Districts; and from 1907 of 22 Districts, (Tochi which was added in 1907 showing no entry for gram).

Gram figures from 1861 to 1882 are higher than the calculated by Rs. 0'020.

‡ Marua.

The records throughout are very incomplete, and since 1908 there has been no entry except for the District of Jhang, and this is the figure that since that date is quoted for the province.

** Kangni.

In 1886 the figure is the average of 17 Districts; by 1900 this had fallen to 14; in 1911 only 8 were left, and this in 1917 fell to 7.

β Maize.

There are records for 4 Districts from 1861 to 1870. From 1886 to 1904 the prices quoted are the average of 18 Districts; in 1905 and 1906 of 20 Districts from 1907 of 22 Districts, (Hissar never having been included).

. Arhar Dal.

The maximum number of entries is 15 and the average is generally deduced from less.

TABLE X

PRICES OF FOOD-GRAINS IN THE PANJAB EXPRESSED AS A

Year	Rice	Wheat	Barley	Bajra
	(1)	(2)	(3)	(4)
1861	88	109	114	96
2	74	71	63	68
3	66	64	59	58
4	78	70	67	75
5	93	82	82	83
6	95	84	80	88
7	88	91	97	93
8	101	117	120	132
9	121	158	157	163
1870	106	120	121	112
1	101	91	89	96
2	95	94	95	97
3	87	86	85	78
4	93	84	85	88
5	87	77	80	75
6	85	74	74	71
7	89	82	78	77
8	126	119	118	142
9	118	147	157	142
1880	121	131	131	121
1	102	110	108	115
2	91	90	84	90
3	89	86	80	75
4	91	79	80	79
5	87	77	74	72
6	90	98	88	100
7	93	130	132	136
8	97	122	131	130
9	98	97	94	107
1890	95	105	104	102
1	102	127	126	132
2	107	140	136	136
3	108	116	108	111
4	97	79	73	93
5	92	100	99	106
6	105	150	171	170
7	135	182	208	208
8	104	116	111	110
9	96	121	127	126
1900	116	158	187	181

Continued on

TABLE X

PERCENTAGE OF THE PRICE IN THE DECENNIUM, 1873-82

Jowar	Gram	Salt	Arith. Aver. of first six com- modities	Arith. Aver. of Cols. (2) to (6)
(5)	(6)	(7)	(8)	(9)
109	119	94	106	109
67	70	100	69	68
56	58	103	60	59
73	68	107	72	71
84	79	110	85	83
83	79	110	85	83
91	99	116	93	94
136	125	110	122	126
155	212	112	161	169
102	141	111	117	119
83	105	76	94	93
103	111	106	99	100
80	85	114	83	83
88	74	109	85	84
79	74	110	79	77
74	65	100	74	72
78	74	90	79	78
145	144	90	132	134
153	156	99	146	151
114	129	97	124	125
109	111	110	109	111
81	87	79	87	86
70	77	78	79	78
75	74	78	80	77
72	72	77	76	73
96	82	77	92	93
138	112	76	123	130
123	115	87	120	124
94	92	89	97	97
100	104	88	102	103
136	118	88	123	128
124	116	89	126	130
100	92	90	106	105
77	68	89	81	78
98	93	89	98	99
163	150	89	151	161
204	222	92	193	205
109	122	93	112	114
122	135	92	121	126
193	202	92	173	184

next page)

TABLE X—(continued)

Year	Rice	Wheat	Barley	Bajra
	(1)	(2)	(3)	(4)
1901	108	125	119	107
2	106	119	127	121
3	104	116	124	115
4	100	107	103	93
5	106(106)†	126(127)†	119(119)†	117(118)†
6	115(115)	129(130)	138(139)	153(155)
7	130(132)	137(140)	138(142)	125(127)
8	161(168)	198(205)	210(216)	203(204)
9	141(145)	187(192)	168(172)	150(150)
1910	129(131)	147(150)	132(134)	133(133)
1	129(130)	136(139)	136(138)	136(147)
2	137(138)	156(156)	176(179)	173(172)
3	139(141)	166(166)	176(179)	170(171)
4	143(146)	181(183)	191(197)	192(193)
5	151(152)	215(214)	204(207)	210(210)
6	146(148)	184(184)	208(214)	197(196)
7	139(139)	198(200)	203(207)	164(164)
8	180(181)	240(241)	249(251)	256(258)
9	238(240)	290(291)	313(310)	382(386)
1920	235(234)	266(266)	269(270)	294(294)

† Figures in brackets indicate what the percentage would have been had the districts 1907. The figures in brackets are strictly comparable with those from 1861

TABLE X—(continued)

Jawar	Gram	Salt	Arith. Aver. of first six commodities	Arith. Aver. of Cols. (2) to (6)
(5)	(6)	(7)	(8)	(9)
110	128	92	116	118
111	123	92	118	120
109	111	82	113	115
83	89	80	96	95
112(113)†	113(112)†	67	115(116)†	117(118)†
149(153)	137(137)	64	137(138)	141(143)
128(129)	142(139)	54	133(135)	134(135)
210(210)	226(223)	50	201(204)	209(212)
154(153)	171(166)	50	162(163)	166(167)
136(136)	128(122)	50	134(134)	135(135)
133(133)	124(119)	49	132(133)	133(133)
178(177)	152(146)	49	162(161)	167(166)
154(153)	162(157)	49	161(161)	166(165)
195(195)	198(196)	50	183(185)	191(193)
224(214)	198(194)	51	200(200)	210(210)
187(187)	192(188)	67	186(186)	194(194)
189(189)	199(194)	79	182(182)	191(191)
332(332)	236(233)	104	249(249)	263(263)
364(364)	331(328)	104	320(320)	336(336)
276(274)	323(318)	99	277(276)	286(284)

of Attock and Lyallpur not been included in 1905, and Kurram and Tochi in giving as they do the percentage calculated from the record of 19 districts

**CURVES REPRESENTING THE PRICES OF FOOD-GRAINS IN THE
PANJAB, PRICES BEING EXPRESSED AS PERCENTAGES OF THE
AVERAGE PRICE FROM 1873 TO 1882, (VIDE TABLE X)**

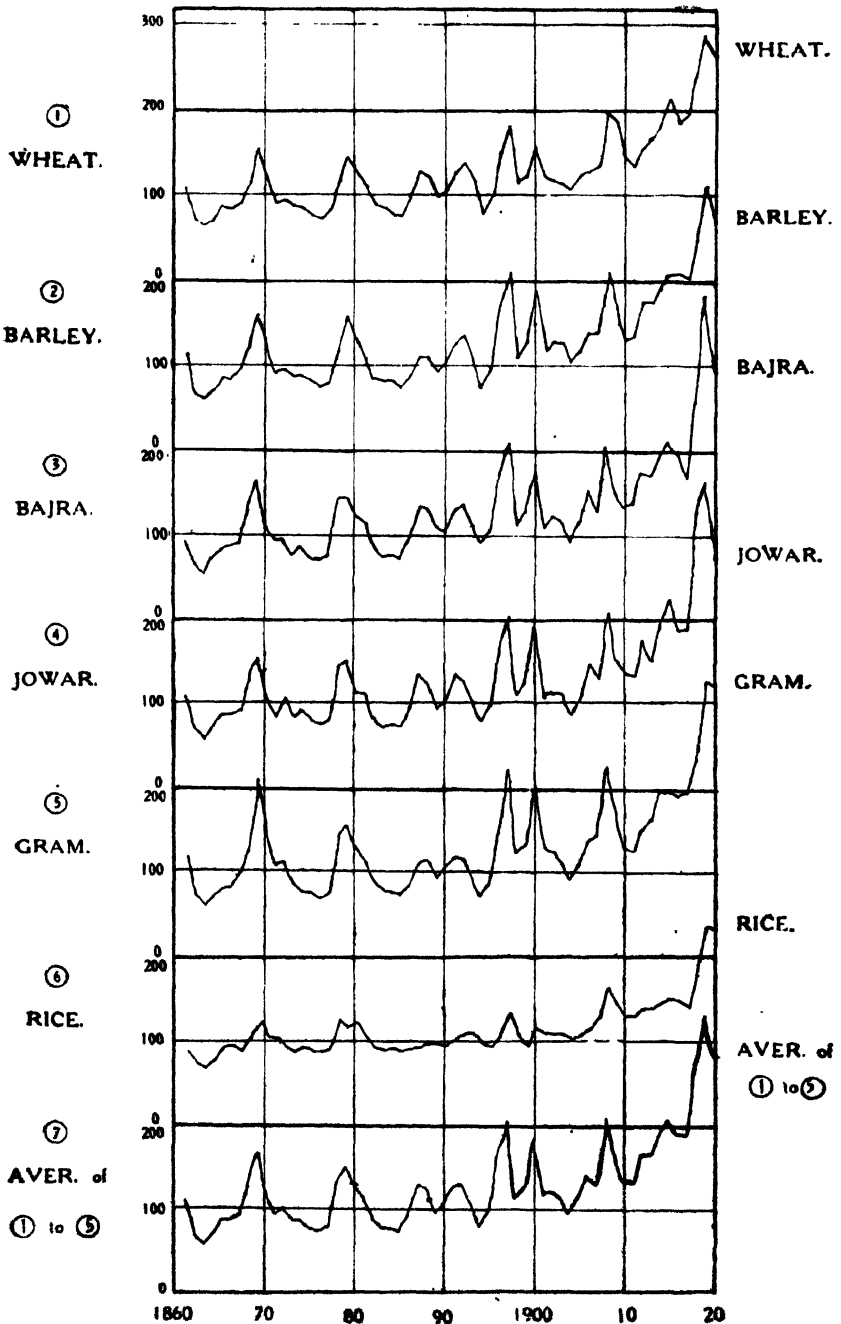
The figures given in Table X for wheat, barley, bajra, jowar, gram and rice, together with the average figures constructed from the first five commodities have been presented graphically in Diagram I. The first six curves represent the prices of wheat, barley, bajra, jowar, gram and rice expressed as a percentage of the average price of each in the ten years 1873-82. The seventh curve presents the arithmetical average derived from the first five commodities, (rice has not been included).

A study of the figures in Table X, or of the curves in Diagram I, suggests the following observations :—

1. Speaking generally, wheat, barley, bajra, jowar and gram tend to move in price as though they were one commodity. Economists in India have long been familiar with the way in which the prices of food-stuffs rose and fell together, but it is doubtful whether the closeness of the relationship has been fully realized. Though the curve for barley were mistaken for that of wheat no very serious error would result. Or to put the same point in another way, if a student were given the price of barley in 1861, and the curve showing the percentage variations in the price of wheat, he might construct a table showing the price of barley over sixty years, and it would be nearer the truth than most people, and perhaps even the economists, would imagine possible.

2. The case of rice is obviously altogether exceptional. Its price feels those influences which affect the prices of the other food-grains, but to a very much slighter extent. Except in very limited areas rice does not form the staple diet anywhere in the Panjab, and so marked is the difference between it and the other food-grains that a second index number has been constructed from which rice has been expressly omitted. This index number naturally shows greater fluctuations than when rice is included. An explanation of the greater stability of rice prices as compared with those of other food-grains may be hazarded, and the problem may be tackled from the standpoint of the demand and supply of that commodity.

DIAGRAM I.
PRICES OF FOOD-GRAINS IN THE PUNJAB
EXPRESSED AS PERCENTAGES OF THEIR
AVERAGE PRICE FROM 1873-82.



The prices of the other food-grains have been largely at the mercy of the seasons. Rice requires for its successful cultivation abundance of water, and may therefore be presumed to be grown where artificial irrigation of some kind can be taken advantage of. Assuming that the supply of water where rice is grown is so abundant that it is not likely to fail even in the worst seasons—e. g., hill streams fed from springs or from melting snow—this would account for its supply being much more constant from season to season than in the case of the other food-grains where a larger proportion is still grown on *barani* ⁽¹⁾. From the side of demand, the price of rice is invariably higher than that of wheat—(vide Table IX) so in periods of scarcity rice does not come within the category of the second line of defence in the same way as barley, bajra, jowar or gram. Although, when wheat has risen 100 per cent., and rice only 50 per cent, the latter may for the time being be comparatively a better bargain, it may mean nothing to the man who is being forced by the rise in the price of wheat to take to cheaper grains.

3. The curves show well defined positions of maxima in 1869, 1879, 1897, 1908 and 1919, with less obvious maximum points in 1887, 1892, 1900 and 1915.

Well defined minimum positions appear in 1863, 1876, 1885, 1894, 1904 and 1911, with less clearly defined turning points in 1889, 1898 and 1917.

These figures do indicate a tendency for high prices to appear about the time when the figure in the decennium changes, and for lower prices to prevail about the middle of the decennium. This matter will be taken up in more detail later when we come to deal with triennial, quinquennial, and decennial averages ⁽²⁾. The extraordinarily high prices which prevailed around 1920 *might* thus be the sum of two movements firstly, the cyclic influence of which there are indications, and secondly, the altogether abnormal circumstances produced by the war, and their effect on the world's output of food

(1) Percentage of the Panjab crop irrigated in 1922-23.

Rice	.. 79'2 per cent.	Bajra	.. 12'4 per cent.
Wheat	.. 52'4 " "	Jowar	.. 21'8 " "
Barley	.. 27'9 " "	Gram	.. 21'6 " "

The percentage of irrigated wheat in 1925 was 57'6. Rice-eaters usually prefer to eat the grain after it has been kept for a year, as this makes it more digestible; this suggests the storage of a large supply which would serve to keep prices steady under a short harvest.

(2) *Vide p. 40 et seq.*

crops. In another fifty years, however, it will be time enough to speak with authority upon this point.

The curve representing the arithmetical average of the percentages of wheat, barley, bajra, jowar and gram shows that food prices were below the 1873-82 average from 1862 to 1867, from 1871 to 1877 (the price in 1872 touched the average), from 1882 to 1886, in 1889, in 1894 and again in 1904.

Prices stood more than 50 per cent. above the average of 1873-82 in 1869, 1879, in 1896 and 1897, in 1900, in 1908 and 1909, and from 1912 to 1920 they have never fallen below this level.

The first time in which these prices rose more than 100 per cent. above the 1873-82 average was in 1897. They again touched that level in 1908 ; they rose slightly above it in 1915 ; and from 1918 to 1920 they have stood much above it.

In 1918 food prices broke all previous records by standing 163 per cent. above the average ; in 1919 this record was eclipsed when the figure was 236 per cent. higher. The year 1920 saw a slight fall, 186 per cent. higher, to be followed in 1921 by a higher level of food prices than had been known before or has been known since.

4. In spite of the remarkable similarity between the curves showing the percentage prices of wheat, barley, bajra, jowar and gram, a close study of them will show that, on the whole, wheat has been subject to smaller fluctuations in price than either of the other food-grains. This point becomes much clearer from the logarithmic curves of food-prices⁽¹⁾, but as many people either pass by such curves in silence, or misread their significance in spite of all explanations, attention may be called to the fact here. If the non-mathematical reader will simply compare the curve showing the percentages of wheat prices with that showing the same data in the case of gram, he will be forced to admit greater stability of wheat prices. If the mathematical reader will turn to the logarithmic curves, and measure off for himself, he will be satisfied that wheat is the commodity which shows the smallest fluctuations.

To make this point still clearer, I have calculated the deviation of wheat and gram prices from the yearly average for all five commodities. The method of calculation should be clear from the following table which it is not thought necessary to complete.

(1) *Vide* curve facing p. 31.

crops. In another fifty years, however, it will be time enough to speak with authority upon this point.

The curve representing the arithmetical average of the percentages of wheat, barley, bajra, jowar and gram shows that food prices were below the 1873-82 average from 1862 to 1867, from 1871 to 1877 (the price in 1872 touched the average), from 1882 to 1886, in 1889, in 1894 and again in 1904.

Prices stood more than 50 per cent. above the average of 1873-82 in 1869, 1879, in 1896 and 1897, in 1900, in 1908 and 1909, and from 1912 to 1920 they have never fallen below this level.

The first time in which these prices rose more than 100 per cent. above the 1873-82 average was in 1897. They again touched that level in 1908 ; they rose slightly above it in 1915 ; and from 1918 to 1920 they have stood much above it.

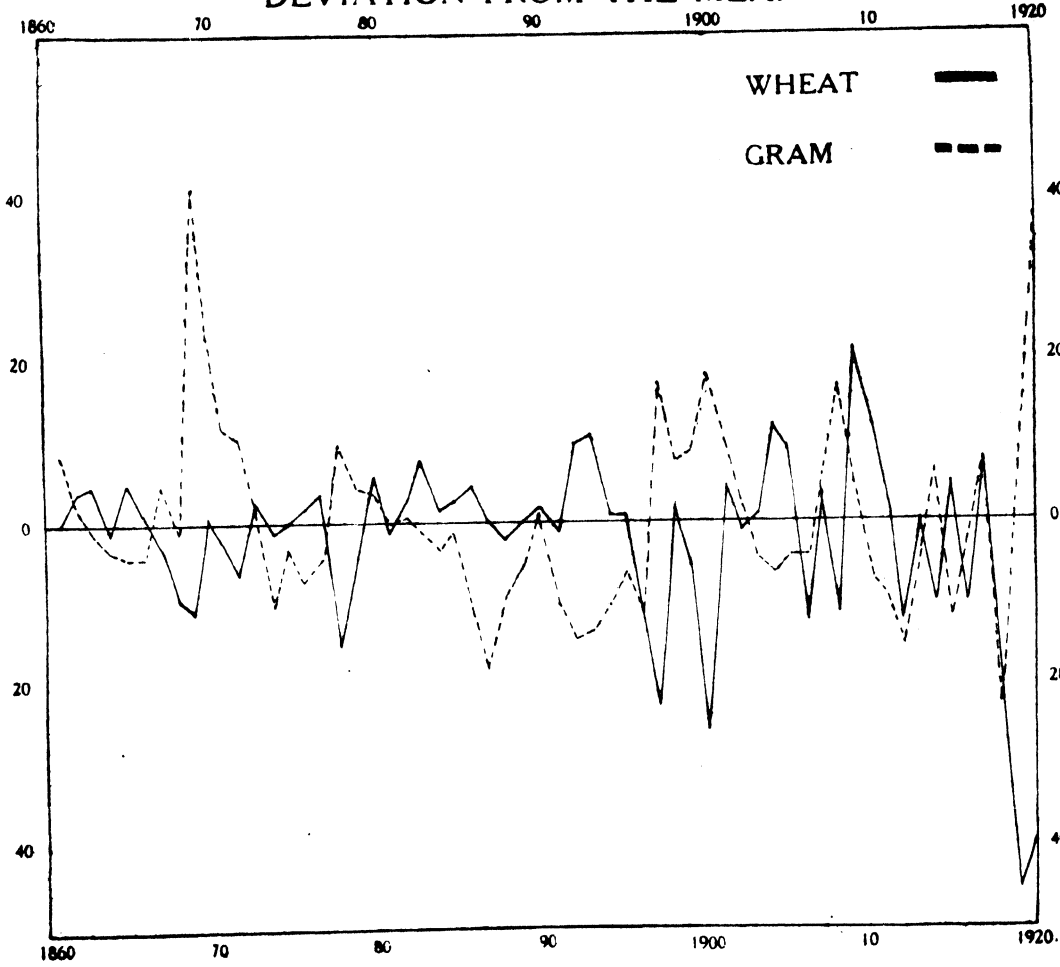
In 1918 food prices broke all previous records by standing 163 per cent. above the average ; in 1919 this record was eclipsed when the figure was 236 per cent. higher. The year 1920 saw a slight fall, 186 per cent. higher, to be followed in 1921 by a higher level of food prices than had been known before or has been known since.

4. In spite of the remarkable similarity between the curves showing the percentage prices of wheat, barley, bajra, jowar and gram, a close study of them will show that, on the whole, wheat has been subject to smaller fluctuations in price than either of the other food-grains. This point becomes much clearer from the logarithmic curves of food-prices⁽¹⁾, but as many people either pass by such curves in silence, or misread their significance in spite of all explanations, attention may be called to the fact here. If the non-mathematical reader will simply compare the curve showing the percentages of wheat prices with that showing the same data in the case of gram, he will be forced to admit greater stability of wheat prices. If the mathematical reader will turn to the logarithmic curves, and measure off for himself, he will be satisfied that wheat is the commodity which shows the smallest fluctuations.

To make this point still clearer, I have calculated the deviation of wheat and gram prices from the yearly average for all five commodities. The method of calculation should be clear from the following table which it is not thought necessary to complete.

(1) *Vide* curve facing p. 31.

DIAGRAM II
DEVIATION FROM THE MEAN



Year	Average of five commodities	Wheat		Gram	
		Percentage.	Deviation	Percentage.	Deviation
			+	-	+
1861	109	109	..	o	118 9
1862	67	71	4	..	70 3
1863	59	64	5	..	58
	etc.	etc.	etc.		etc.

The figures showing the deviation as calculated above for the whole period from 1861 to 1920 have been plotted in Diagram II. What becomes at once apparent from this curve is that with a few exceptions where one curve is positive, the other is negative. If negative figures in the case of gram are plotted as positive and *vice versa*; if, in mathematical language, in the case of gram, y is plotted as $-y$, the curves show a remarkable similarity. When these curves representing the deviations of wheat and gram from the average are compared with that representing the general level of food prices, it will be seen that, with a few exceptions, when prices are high the deviation in the case of wheat tends to be negative, and in the case of gram to be positive. On the other hand, when prices are low, the tendency is for the deviation in the case of wheat to be positive and in the case of gram to be negative. In other words, the curves of average prices tends to exaggerate the fluctuations in the case of wheat, and to understate them for gram: the fluctuations in the case of wheat are generally less than would be indicated by the average, and in the case of gram they are greater.

Exactly the same conclusion is arrived at if the deviation in the case of wheat and gram is calculated from the prices of each in the basal period, 1873-82. There are a few exceptions, but the general result is undoubtedly that, whether the deviation is positive or negative, it is greater in the case of gram than in the case of wheat.

If the deviations of the prices of wheat, barley, bajra, jowar and gram from their price in the basal period, 1873-82 be totalled over the sixty years and divided by 60, we get the following results:—

Commodity	Deviation (+) i.e., where the price exceeds the price in the basal period (1873-82)	Deviation (—) i.e., where the price is less than the price in the basal period (1873-82)	Total Deviation
Wheat	33.3	5.6	38.9
Barley	36.2	6.6	42.8
Bajra	36.3	5.9	42.2
Jowar	36.5	7.1	43.6
Gram	37.3	7.5	44.8

It will be noticed that wheat shows the smallest fluctuations, both positive and negative. When the general level of prices is high, wheat rises generally less than would be indicated by the average deduced from the price of wheat, barley, bajra, jowar and gram ; when, on the other hand, the general price level is low, the price of wheat does not sink to the same extent as does that of other commodities.

There are no doubt various reasons for this phenomenon. A few are suggested below, but no attempt is made to assess their relative importance.

(a) The stocks of wheat carried over from year to year tend to be greater than in the case of the coarser grains⁽¹⁾. The shortage of one season may thus be partly supplemented by supplies carried over from the previous year, and hence in a time of scarcity wheat prices rise by a smaller percentage than the prices of the other food-grains. So, when the price of food-grains is very low, part of that year's supply of wheat may be carried over as reserve, and thus the price falls by less than the average.

(b) Another consideration which must exercise an important influence is this, that the percentage of the irrigated area to the total area under wheat is very much greater than in the case of the other food-grains⁽²⁾, (rice being of course excepted). The coarser food-grains are largely *barani* crops, and, as such, must feel the effects of a bad season very much more than wheat where a larger percentage is irrigated. The difference between the out turn of such crops in good and bad years must be very much greater than the difference in the case of wheat, and this in itself may be a salient factor in leading to greater fluctuations in their price.

(c) The market for wheat is wider than that for the other food-grains and the assumption is commonly made that the wider the market for a commodity so much less is the tendency to fluctuations

(1) I am informed by Professor Stewart of the Agricultural College, Lyallpur, that it was estimated that in April, 1924—i.e., when the new wheat crop was being harvested—1/16th of the previous wheat crop in the Lyallpur District had not come upon the market. At the same time the Commercial Correspondent of "The Civil and Military Gazette" in the issue of 15th April, 1924, referred to the wheat market as very dull with no supply coming on the market.

(2) *Vide* footnote (1) on p. 23. In British India, 45·2 per cent. of the area under wheat was irrigated in 1924-25.

in its price⁽¹⁾. In good years wheat is much more largely exported from the Panjab than any of the other food-grains⁽²⁾. As soon as the price of wheat in the Panjab falls to a certain level, it becomes a feasible proposition to export it to Liverpool, and the price in the Panjab must then be largely influenced by the world price. With other food-grains such as bajra, jowar and gram which are largely consumed within the Province, this steadying influence is much less operative, and this would account for them falling by a larger percentage than wheat. When, on the other hand, food-prices are high, that wheat which in a year of plenty would have been exported will be directed to internal consumption, and hence through the export reserve—"reserve", we shall call it, to avoid the use of the much contested word, "surplus",—wheat rises in times of scarcity by a smaller percentage than the other food-grains which possess no such reserve. The weakness of this explanation—(and it cannot fail to be a potent influence under present conditions)—is that in the earlier years of the period of which we are treating when the export of wheat from the Panjab was of comparatively little importance, the phenomenon was quite as noticeable as it is now. Another explanation is therefore hazarded.

(d) It has long been recognised in the Panjab that so far as the consumption of food-grains is concerned, the law of substitution is continually at work. "Poor people, finding that the price of wheat is high, and they cannot afford to buy it, substitute coarser grains for it in their consumption"⁽³⁾. In England the process is often found at work as between wheat, potatoes and meat, but is perhaps more familiar in the case of drink than in the case of food. A rise in the price of beer leads to the substitution of spirits, and vice versa. There, however, in normal times wheaten bread is so distinctly one of the cheapest foods available that the substitution of the flour of coarser grains for wheaten flour which

(1) "This illustrates well the great law, that the larger the market for a commodity the smaller generally are the fluctuations in its price, and the lower is the percentage on the turn-over which dealers charge for doing business in it" Marshall's "Principles of Economics", 6th Edition, p. 328.

(2) The percentage of the various crops exported from the Panjab in 1920-2 taking net exports, (i.e., exports less imports) is given below:—

Rice	1'6 %	Bajra	} 5'7 %
Wheat	46'4 %	Jowar	

(3) Brij Narain: "Essays on Indian Economic Problems", p. 492.

is familiar in the Panjab, is practically unknown. In this connection it is interesting to recall that in the discussion in the House of Commons on Whitbread's ' Minimum Wages Bill ' at the end of the 18th century, Pitt severely censured the use of wheaten bread by the poorest of the community : he recommended as a way out of the difficulties of the time that the poor should change their diet, and in particular, that those in the South should follow the example of the North, and eat oatmeal. The idea never took on : the people clung to what Pitt stigmatised as " groundless prejudice". During the late war the English public became familiar with bread made from adulterated flour, but the change had to be made by legal enactment. It was perhaps one of the most unpopular measures of the war⁽¹⁾.

In the Panjab the process of substitution takes place in response to changes in price. We have what might be called the " marginal consumer " of wheat, who, when the price of wheat is low, makes wheat his staple food, but who, when the price is high, is forced to transfer to the coarser grains. Even in the case of other classes, who could hardly be called marginal consumers, there is a tendency for their consumption of wheat to contract when its price rises ; this brings in its train a rise in the demand for the coarser and cheaper grains. It cannot be repeated too often that in any study of prices the demand with which we are concerned must be an " effective demand ", *i. e.*, a desire to possess backed up by the means of purchase. If wheat has risen in price to such a level that a particular class can no longer afford to buy it, that class becomes non-effective from the standpoint of directly influencing the price. Now, in so far as this process of substitution goes on as between wheat and the coarser grains, it would tend to account for the phenomenon we are attempting to explain. When food-prices are high, a class which was previously consuming wheat is forced to curtail its consumption of that commodity, and take refuge in the coarser grains. The contraction of the demand for wheat, and the consequent rise in the demand for the coarser grains, would tend to bring about the result of wheat prices rising by a smaller percentage than those of the

(1) I have myself, in censoring soldiers' letters in France, come across the statement that when they came on leave from the front, they would take to their folks at home, as the souvenir which would be most appreciated, a loaf of white bread. The Army in France was throughout the war supplied with wheaten bread.

coarser grains. On the other hand, when food prices are low, a larger number of consumers come into the field with an effective demand for wheat: and classes previously consuming wheat extend their consumption of that commodity, taking at the same time less of the coarser grains. The natural effect is that wheat prices tend to fall by a smaller percentage than those of the other grains.

LOGARITHMIC CURVE OF PANJAB FOOD PRICES

A curve representing either absolute prices, or these prices expressed as a percentage of their price in a given year or of the average of their prices in a series of years, (vide Curve facing p 22) is possessed of one great disadvantage. If the prices of food-grains rose, say from Re. 1 per maund to Rs. 2 per maund, this would be represented by a given vertical distance. Assume for the moment that the level has become stabilised around Rs. 2 per maund, and then rises to Rs 4 per maund. This would be represented by a vertical distance twice as great as the first change, and yet in both cases the rise has been one of 100 per cent. So if prices are expressed as percentages of their price in a basal period, when the percentage figure rises from, say, 100 to 150, the vertical distance by which this change will be represented must be the same as if the figure rose from 400 to 450. If we assume that in the first case that the price level had before the change been oscillating around 100, and in the second case around 400, it needs no demonstration to show that the change in the first case is one of larger dimensions than in the second, though they would both be represented by the same vertical distance in the diagram.

To make this point more definite, the reader might kindly refer to the Curve showing percentage prices in the case of wheat (Diagram 1). Two parts of the curve that present a distinct resemblance are those between 1863 and 1869, and between 1904 and 1908. The form of the curve and the amount of the rise appear very similar in these two portions. As a matter of fact the percentage actually rose from 64 to 158 in the first period, and from 107 to 198 in the latter. The absolute rise is approximately equal. But it is obvious that, although the absolute difference between 64 and 158 and between 107 and 198 is approximately equal, the first is likely to be a more serious economic phenomenon than the second.

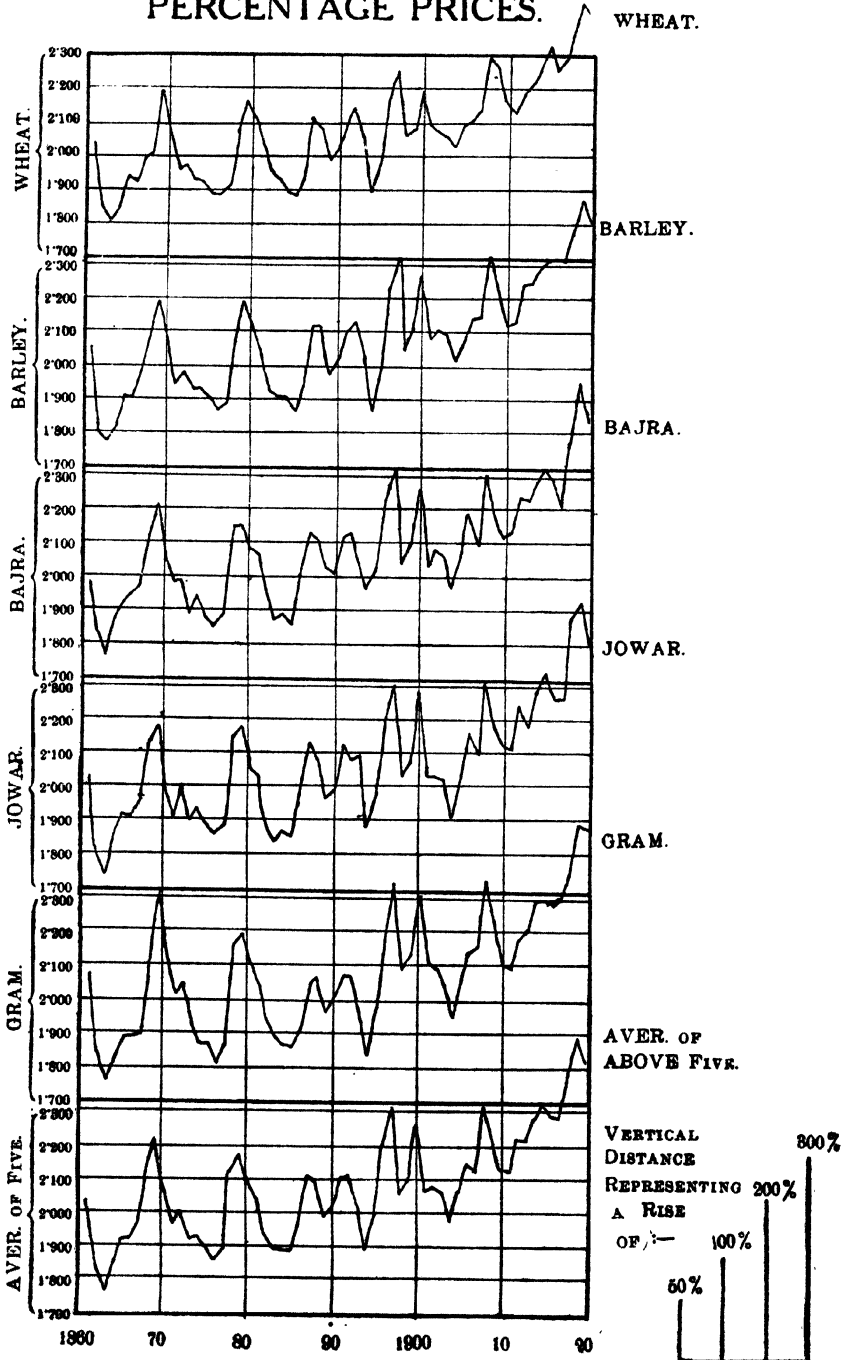
The first is equivalent to a rise of 147 per cent, while the latter is little more than half that figure, *viz.*, 85 per cent. Or take, say the rise in the general average between 1894 and 1897, as compared with that between 1917 and 1919. In the first case the rise was from 78 to 205, or 163 per cent.; while in the latter it was from 191 to 336, or 76 per cent.

When a mountaineer looks at the cross section of a piece of country he has to traverse, there are two considerations he will bear in mind. The first is the number of feet he will have to climb day by day, and the second is the altitude from which he will have to start. A climb of 5,000 feet is a thing he would treat lightly if he were starting from an altitude of 5,000 feet. He knows, however, that a similar climb from an altitude of 15,000 feet will be an altogether different and more difficult proposition, even although he has had time to linger at 15,000 feet and get accustomed to the rarified atmosphere. Would he not laugh to scorn the person who suggested to him that the climb in the first case might be presented as one of 100 per cent., while in the case of the latter it was no more than 33 per cent?

The case of prices is almost the converse of that stated above. There the rise in the general level from 5,000 to 10,000 is likely to be a more serious economic phenomenon and to produce more hardship and suffering than if the level rose from 15,000 to 20,000—the assumption being made in each case that before the change prices were more or less stabilised around the first mentioned figure. When dealing with prices the consideration of first-rate importance is not the absolute change so much as the ratio of the change, the ratio which the new price bears to the old one. With an ordinary curve, either of absolute prices, or of these expressed as percentages of a base, this consideration cannot be fully brought out.

Here, however, the difficulty can be surmounted by plotting not the prices, nor their percentages, but the logarithms either of these prices or of their percentages. Such a curve is a curve of ratios, and the reader must be on his guard against interpreting it in any other way. In such a curve the same vertical distance represents an equal percentage increase or decrease at any part of the scale, and the vertical distance equivalent to a rise of say, 50%, 100%,

DIAGRAM III LOGARITHMIC CURVES OF PERCENTAGE PRICES.



200%, etc., can be shown by drawing lines of the appropriate length beside the curve.

Such a curve showing the logarithms of the percentage prices of the principal food-grains in the Panjab, and of the average got from wheat, barley, bajra, jowar and gram has been prepared— (Diagram III). A close study of this diagram, and a comparison with that representing percentages (vide Curve facing p. 22) brings out certain interesting results.

The first point which is most clearly demonstrated is that towards the end of the period food prices in the Panjab have been subject to much smaller fluctuations than in the earlier period. In the case of most of the commodities, the ratio of the increase of price between 1904 and 1920 has been roughly equivalent to that between 1863 and 1869; in the one case the change is spread over sixteen years, and in the other over six. The greater stability of the level of food prices may be said to be one of the chief results brought out by the logarithmic curves. When ratios are taken and not absolute prices, the crests in the earlier period become much magnified, and those in the latter period look less deadly because the point of departure is so much higher.

A second point, to which reference has already been made⁽¹⁾, which is brought out most clearly is the smaller fluctuations in the case of wheat than in the case of the other food-grains. The same vertical distance in all cases means an equal percentage increase. Any one who will take the trouble to measure and compare the peaks in the case of wheat with those for the other commodities will see that almost invariably wheat shows the smallest fluctuations.

PRICE OF WHEAT IN THE SIX GROUPS OF DISTRICTS IN THE PANJAB

For wheat the average yearly price in each of the six Groups of Districts in the Panjab⁽²⁾ has been plotted. The figures for the Northern and Western Groups are not strictly comparable over the whole period in that in 1905 Attock was added to the former and Lyallpur to the latter, while in 1907 Kurram made its appearance

(1) *Vide p. 24 ante.*

(2) *Vide p. 3 ante.*

in the first and Tochi in the second. Otherwise the districts included in each Group are as given in footnote on page 3.

The most outstanding feature of the diagram, as might be expected, is the much greater dispersion of the curves in the earlier years of the period. In 1869, for example, while wheat in the Northern Group (Rawalpindi and Peshawar) stood no higher than Rs 2'560 per maund, the figure for the Southern Group (Hissar and Ferozepore) was no less than Rs. 4'088 a difference of Rs. 1'5 per maund, or approximately Rs. 41 per ton. In 1879, on the other hand, the tables are practically turned; in that year the price of wheat in the Northern Group had risen to no less than Rs 4'928 per maund, while it stood no higher than Rs 2'783 in the South-Eastern Group (Delhi, Rohtak and Karnal)—a difference of Rs 2'145 per maund, or approximately Rs. 59 per ton. From about 1885 onwards the prices in the different districts tend much more strongly towards equality. The cause is undoubtedly to be found in the improved means of transportation within the Province⁽¹⁾. Such dispersion as is noticeable in the years before 1885, even when the prices of wheat are not particularly high, becomes a much more uncommon feature after that date. Even so far as absolute prices are concerned, the earlier period can boast of peaks quite as fearsome as any to be found up to 1920.

For purposes of comparison, I set out below the differences between the prices in different districts when these differences were at a maximum in the years before and after 1885.

Year	District Group	Price of Wheat in rupees per maund	District Group	Price of Wheat in rupees per maund	Difference between (3) & (5) in rupees
(1)	(2)	(3)	(4)	(5)	(6)
1863	S. E.	1'563	So.	1'146	'817
1869	So.	4'088	N.	2'560	1'528
1871	N.	2'406	S. M.	1'605	'801
1879	N.	4'928	S. E.	2'738	2'145
1880	N.	4'543	S. E.	2'363	2'180
1884	S. E.	1'951	N.	1'361	'590

(1) For a short summary of the progress of railway construction in the Panjab, see Calvert's "The Wealth and Welfare of the Panjab", p. 53.

Year	District Group	Price of Wheat in rupees per maund	District Group	Price of Wheat in rupees per maund	Difference between (3) & (5) in rupees
(1)	(2)	(3)	(4)	(5)	(6)
1889	S. E.	2'286	S. M.	1'900	'386
1894	S. E.	1'917	C.	1'540	'377
1896	S. M.	3'71	C.	3'097	'613
1903	N.	2'662	S. M.	2'258	'404
1907	S. E.	3'373	N.	2'692	'681
1908	S. E.	4'679	W.	3'818	'861
1913	N.	3'831	S. M.	3'345	'486
1919	So.	6'523	W.	5'753	'770

The years selected in both parts of the Table are those in which the difference between the prices in different districts is the greatest. In other years it may be presumed that the difference is less

In the second part of the Table there is nothing at all comparable with the differences to be observed in the first part. The maximum difference in the second part is in 1908 when the price of wheat per maund in the South-Eastern Group was some 14 annas higher than in the Western Group. In 1880, on the other hand, the difference between the Northern and the South-Eastern Group was no less than two rupees, three annas per maund. The cost of transporting wheat from Multan to Ambala is now approximately 7 annas 11 pies per maund; from Rawalpindi to Delhi 9 annas, 6 pies per maund.

Thus in so far as the difference between the prices in different districts depends upon the cost of transportation, we might say that the "wheat points" within the Province—(to adopt a simile from the transactions of the foreign exchanges)—are not likely to be further apart than 10 annas. In other words, if the price in one district exceeds that in another by more than 10 annas, wheat is likely to start moving from the one to the other. This applies of course to the headquarters of districts, and not to regions far remote from the railway line.

As regards the relative level of wheat prices in the different Groups, it is almost impossible to generalise from the diagram. No one Group evinces a clear tendency to be either above or below the others throughout the period. Generally speaking, the price in the Sub-montane Group as might be expected, has shown a tendency throughout the period to be below, rather than above, the others; the price in the South Eastern Group tends more often than not to be above than below the average. A rather striking fact is the alteration in the relative position of the Western Group. In the earlier part of the period, in fact till about the beginning of the present century, this Group invariably showed a comparatively high level, which was particularly pronounced in times of scarcity. From 1905 onwards it practically leads the way as the district with the lowest level. This is undoubtedly to be ascribed to the opening up of the new Canal Colonies, and the introduction of Lyallpur in 1905 as one of the Districts in the Western Group.

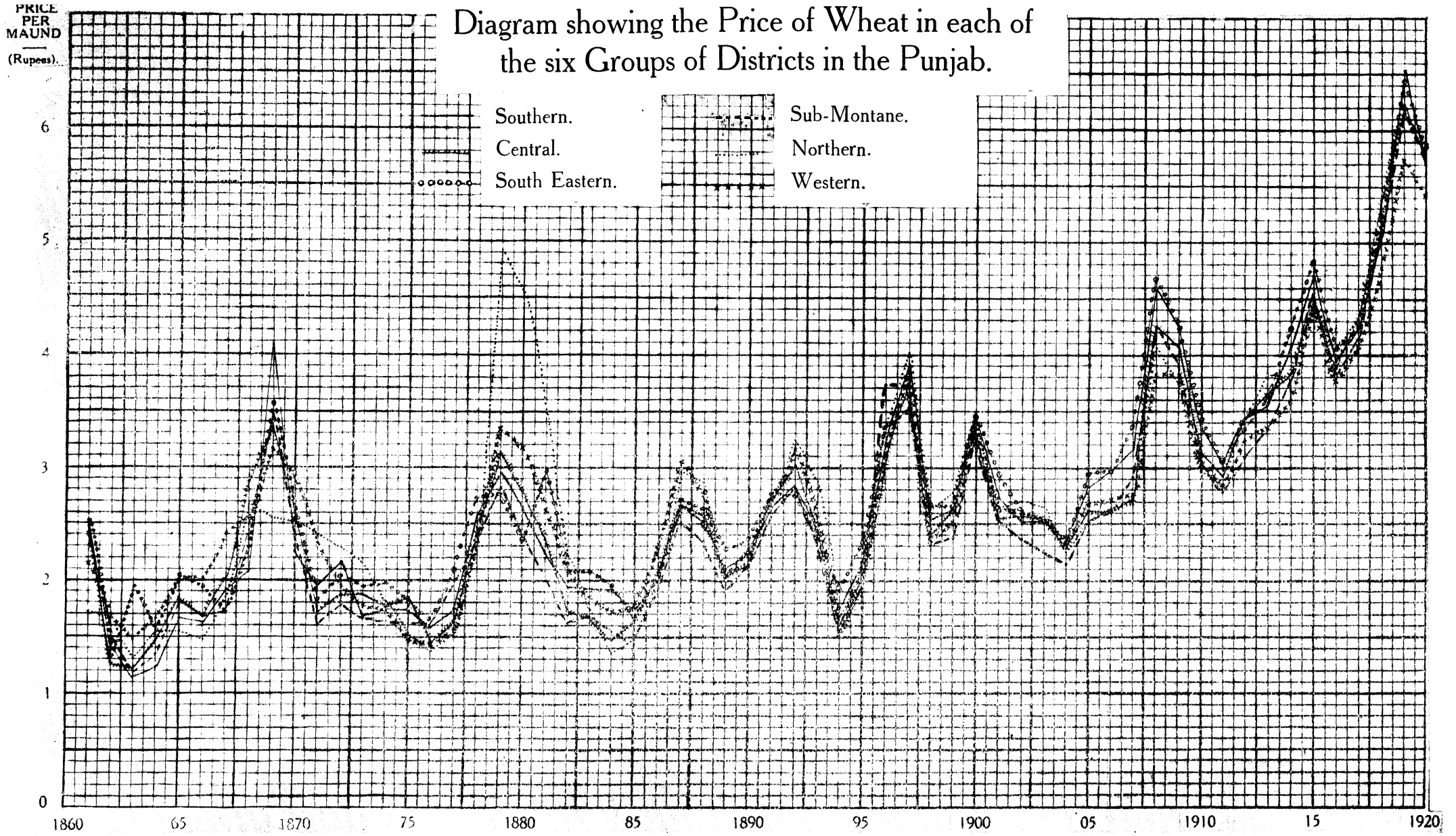
RELATIVE PRICES OF RICE, WHEAT, BARLEY,
BAJRA, JOWAR AND GRAM

REMARKABLE STABILITY

In Table XI, the prices of the various food-grains have been expressed for each year as a percentage of the price of wheat in that year. The decennial averages obtained from that Table are reproduced below; also the average for the first thirty and the second thirty years; and the average for the sixty years taken as a whole.

		Rice	Wheat	Barley	Bajra	Jowar	Gram
<i>Aver.</i>	1861-70	184	100	66	88	78	85
	71-80	198	100	68	88	80	83
	81-90	183	100	66	89	76	76
	91-00	162	100	69	95	81	81
	1901-10	166	100	67	85	74	80
	11-20	155	100	71	93	86	84
<i>Aver.</i>	1861-90	188	100	67	88	78	81
	1891-1920	161	100	69	91	80	82
<i>Aver.</i>	1861-1920	175	100	68	90	79	81

Diagram showing the Price of Wheat in each of the six Groups of Districts in the Punjab.



Two significant results may be noted. In the first place the comparative stability of the prices of barley, bajra, jowar and gram with reference to wheat is most striking. In each case there seems a slight tendency for these to rise in value relatively to wheat, but the change is so small as to be neglected for practical purposes. In the case of barley, bajra, jowar and gram the average prices in the second thirty years stand to those in the first thirty as 67 to 69, 88 to 91, 78 to 80, 81 to 82. When the great changes that have taken place in the agriculture of the Province through the extension of irrigation and means of transportation are borne in mind, this result is even more striking. No argument is more common than that the extension of irrigation has made it more difficult to procure feeding stuffs for cattle. Undoubtedly the conversion of grazing land into arable has limited the facilities for the rough grazing of stock, but in so far as typical feeding stuffs are concerned, they have shown little tendency to rise in value as compared with wheat. Relatively to wheat their value over the sixty years has been comparatively stable. Such difficulty as is alleged to exist in procuring them must thus have arisen from the rise in the general level of food prices, and not in the rise of these with reference to wheat.

The second point which deserves notice, though it is somewhat difficult to account for, is the fact that in terms of wheat, rice has fallen in value. For the six decades for which figures are available, the percentage price of rice in terms of wheat has been 184, 198, 183, 162, 166 and 155. Compared with the remarkable relative stability in the case of the other food-grains, this relative decline in the value of rice is even more noteworthy. It may be connected with improved railway facilities which make the import of rice into the Province from Bengal and the United Provinces more easy or with the extension of irrigation which confers a greater advantage upon rice than upon the other food-grains.

TABLE XI

TABLE SHOWING THE YEARLY PRICES OF RICE, BARLEY, BAJRA, JOWAR
AND GRAM EXPRESSED AS A PERCENTAGE OF THE PRICE OF
WHEAT IN THAT YEAR

Year	Rice	Wheat	Barley	Bajra	Jowar	Gram
1861	153	100	70	77	79	89
2	198	100	60	84	75	80
3	195	100	62	80	70	73
4	212	100	65	96	84	80
5	201	100	63	84	76	73
6	215	100	64	93	79	76
7	188	100	72	90	79	88
8	164	100	69	99	92	86
9	146	100	67	91	77	109
70	168	100	68	82	67	95
<i>Aver. 1861-70</i>	<i>184.0</i>	<i>100.0</i>	<i>66.0</i>	<i>87.6</i>	<i>77.8</i>	<i>84.9</i>
71	212	100	66	93	73	94
2	194	100	68	91	87	95
3	192	100	68	93	83	72
4	213	100	68	93	83	72
5	215	100	70	86	81	78
6	218	100	68	85	79	71
7	207	100	64	83	75	74
8	201	100	67	105	97	99
9	154	100	72	85	83	86
80	176	100	67	82	69	80
<i>Aver. 1871-80</i>	<i>198.2</i>	<i>100.0</i>	<i>67.6</i>	<i>88.3</i>	<i>80.1</i>	<i>83.0</i>
81	176	100	66	92	79	82
2	194	100	63	89	71	79
3	198	100	62	76	64	73
4	219	100	68	88	75	76
5	214	100	65	82	74	77
6	175	100	60	90	78	68
7	136	100	69	92	84	70
8	152	100	72	94	80	76
9	193	100	66	98	77	77
90	173	100	67	86	76	81
<i>Aver. 1881-90</i>	<i>183.0</i>	<i>100.0</i>	<i>65.8</i>	<i>88.7</i>	<i>75.8</i>	<i>75.9</i>
91	152	100	67	92	85	75
2	146	100	65	86	70	67
3	178	100	62	84	69	64
4	234	100	62	113	77	70
5	177	100	67	94	78	76
6	133	100	76	100	86	81
7	142	100	77	101	89	99
8	170	100	64	84	74	86
9	152	100	71	93	81	91
1900	140	100	80	101	97	104
<i>Aver. 1891-1900</i>	<i>162.4</i>	<i>100.0</i>	<i>69.1</i>	<i>94.5</i>	<i>80.6</i>	<i>81.3</i>

(Continued on next page)

TABLE XI—(continued)

Year	Rice	Wheat	Barley	Bajra	Jowar	Gram
1901	165	100	64	76	70	83
2	170	100	72	90	74	84
3	171	100	72	87	75	78
4	178	100	65	77	62	68
5	160	100	64	82	71	75
6	169	100	72	114	92	86
7	180	100	68	80	74	84
8	155	100	71	91	84	93
9	145	100	61	71	66	75
10	168	100	60	80	73	71
<i>Aver. 1901-10</i>	<i>166.1</i>	<i>100.0</i>	<i>66.9</i>	<i>84.8</i>	<i>74.1</i>	<i>79.7</i>
1911	182	100	67	88	78	74
2	168	100	77	99	91	80
3	159	100	71	90	74	79
4	152	100	71	94	86	90
5	134	100	64	86	83	75
6	151	100	76	95	81	85
7	134	100	69	73	76	82
8	144	100	70	95	110	80
9	156	100	73	116	99	92
20	168	100	68	98	82	99
<i>Aver. 1911-20</i>	<i>154.8</i>	<i>100.0</i>	<i>70.6</i>	<i>93.4</i>	<i>86.0</i>	<i>83.6</i>
<i>Aver. 1861-1920</i>	<i>175</i>	<i>100</i>	<i>68</i>	<i>90</i>	<i>79</i>	<i>81</i>

THE GENERAL LEVEL OF PANJAB FOOD PRICES

The yearly prices of wheat, barley, bajra, jowar and gram have already been expressed as a percentage of the average price of each of these food-grains in the ten years 1873-82, (vide Table X). An arithmetical average of the five percentages so obtained for each year has been constructed, and this figure year by year may roughly be said to indicate the price variations in Panjab food prices (vide Col. 9 of Table X). This average figure has been presented graphically in the lowest curve in the diagram facing page 22.

It has already been pointed out⁽¹⁾ that the percentage variations in the prices of the five food-grains are so similar that no very serious error would have been incurred had wheat alone been taken as representative of the others. It seems advisable, however, to take advantage of all the reliable data available, and take the average as deduced from the five commodities.

A study of either the actual figures showing this average, or of the curve constructed from them, shows clearly the fluctuations from year to year. These yearly oscillations, however, particularly in the earlier years, are so violent that from either the figures or the diagram, as they stand, it is not easy to get any idea of the *general* trend of food-grain prices. It is equally difficult to say definitely from them whether there has been in evidence a well defined cycle of high and low prices. If we take maximum turning points, for example, we find these clearly marked in the years 1869 and 1879. In the next decade prices fall very low in 1885, and then it looks as though the story of the two previous decades were to repeat itself; but prices after rising until 1887 then fall, and rise again to another maximum in 1892. Similarly in the last decade of the century, high prices show a double peak with its apices in 1897 and 1900. If we are to investigate the *general* trend of these prices, and the problem of the periodicity of high and low prices, some method must be adopted which will minimise annual fluctuations, and show more clearly the general tendency.

The simplest and most convenient method for this purpose is to take for each year, not the price of that year, but the averag

(1) *Vide* page 22 ante.

of that price with that of one, two, three, four or five years before and after the year in question. In this way, any exceptional fluctuation in one particular year will be softened down, and the larger the number of years we take the smaller will become the yearly fluctuations. A three-yearly average, for example, still shows considerable short-period fluctuations; these are smaller than those in the curve of yearly prices, but for the purpose now in view the three-yearly average is only a little more useful than the yearly percentage. As the period is widened, however,—as we take a five-yearly, a seven-yearly or a ten-yearly period—annual fluctuations become less prominent, and the *general* tendency, upwards or downwards, becomes more prominent

A table constructed in this manner is set out overleaf.

TABLE XII
PANJAB FOOD-GRAIN PRICES
Three-Five-Seven-Ten-Yearly Averages

Year	Average price of wheat, barley, bajra, jowar and gram as a percentage of their average price from 1873 to 1882	Averages			
		Three Yearly	Five Yearly	Seven Yearly	Ten Yearly
1861	109				
2	67	78			
3	59	66	78		
4	71	71	73	81	
5	83	79	78	83	
6	83	87	91	98	98
7	94	101	111	106	96
8	126	130	118	110	100
9	169	138	120	112	102
1870	119	127	121	112	103
1	93	104	113	111	102
2	100	92	96	104	100
3	82	89	87	90	101
4	84	81	83	84	99
5	77	78	79	90	100
6	72	76	89	97	101
7	78	95	102	103	102
8	134	121	112	107	100
9	151	137	120	108	99
1880	125	129	121	109	99
1	111	107	110	109	101
2	86	92	95	100	106
3	78	80	85	92	

(Continued on next page)

TABLE XII

PANJAB FOOD GRAIN PRICES.—(continued)

Year	Average price of wheat, barley, bajra, jowar and gram as a percentage of their average price from 1873 to 1882	Average.			
		Three Yearly	Five Yearly	Seven Yearly	Ten Yearly
1884	77	76	82	93	105
5	74	81	90	95	99
6	93	99	100	96	97
7	130	116	104	100	99
8	124	117	109	107	103
9	97	108	116	115	106
1890	103	109	116	117	106
1	128	120	113	109	109
2	130	121	109	106	115
3	105	104	108	115	123
4	78	94	115	129	122
5	99	113	130	127	125
6	161	155	131	127	133
7	205	160	141	138	132
8	114	148	158	144	131
9	126	141	149	147	132
1900	184	143	132	140	134
1	118	141	133	125	135
2	120	118	126	125	133
3	115	110	113	127	126
4	95	109	118	120	136
5	117	118	120	133	140

(Continued on the next page)

TABLE XII.

PANJAB FOOD-GRAIN PRICES—(continued)

Year	Average price of wheat, barley, bajra, jowar and gram as a percentage of their average price from 1873 to 1882	Averages.			
		Three Yearly	Five Yearly	Seven Yearly	Ten Yearly
1906	141	130	139	139	135
7	133	101	153	142	136
8	209	169	157	148	141
9	166	170	155	155	146
1910	135	145	162	158	156
1	133	145	153	167	165
2	107	155	158	167	170
3	166	175	173	171	176
4	191	189	186	179	182
5	210	198	190	197	199
6	194	198	209	222	214
7	191	216	239	239	
8	263	263	254		
9	336	295			
1920	286				

A diagram has been prepared in which have been plotted :—

- (a) the yearly percentage figures,
- (b) „ three-yearly average,
- (c) „ five-yearly „
- (d) „ ten-yearly „
- (e) a hand drafted smoothed curve through the ten yearly average.

All of these curves are deserving of close study. The first shows clearly the huge annual fluctuations in the prices of the food-grains, and differentiates clearly the fat years from the lean. It tells its own tale of years when the monsoon was favourable and when the reverse. But it gives us only the roughest indication as to whether the *general* level of prices was rising or falling.

The curve showing the three-yearly average shows smaller oscillations, but takes us only a short way in the quest we are after.

The curve presenting the five-yearly average is of particular interest in that it seems to indicate a well-defined periodicity. The tendency for an era of high prices to occur towards the end of each decennium seems clearly brought out by this curve. Well-defined maximum turning points are shown by it in the years 1869-70, 1879-80, 1889-90, 1898, 1908-10,—(and we may surmise that another will be found around 1920). The reader must not be distressed though such a curve as this gives a maximum turning point when prices actually were low. If two periods of maxima occur at short intervals, *e.g.*, in 1887 and in 1892, the method of a five-yearly average may show the maximum as it does in 1889-90 when prices actually were low. This objection can only be removed by varying the length of the period chosen. The tendency, however, which the curve shows for eras of high and low prices to recur about every ten years seems to us of particular interest—but we shall return to this point later.

In the curve showing the ten-yearly average, the influence of particular years, whether of plenty or of scarcity is much less marked. In its construction fat years have been set against lean years; the cheap prices of 1863 and 1876 have been balanced by the dear prices of 1869 and 1879. By so doing, we have arrived at

a curve which gives us roughly the *general* trend of food prices. This curve has been smoothed by a hand-drafted line, and this shows us clearly the *general* level of food prices when yearly fluctuations have been largely eliminated.

A study of this new smoothed curve makes four points abundantly clear, and each demands an explanation :—

1. Firstly, there is the remarkable stability in the *general* level of prices from 1861 to 1887⁽¹⁾, in spite of years of severe famine and years of plenty.

2. Secondly, the rise in the *general* level of food prices which set in about 1887, and continued till 1896.

3. Thirdly, the comparative stability which set in in 1896 and continued until about 1905.

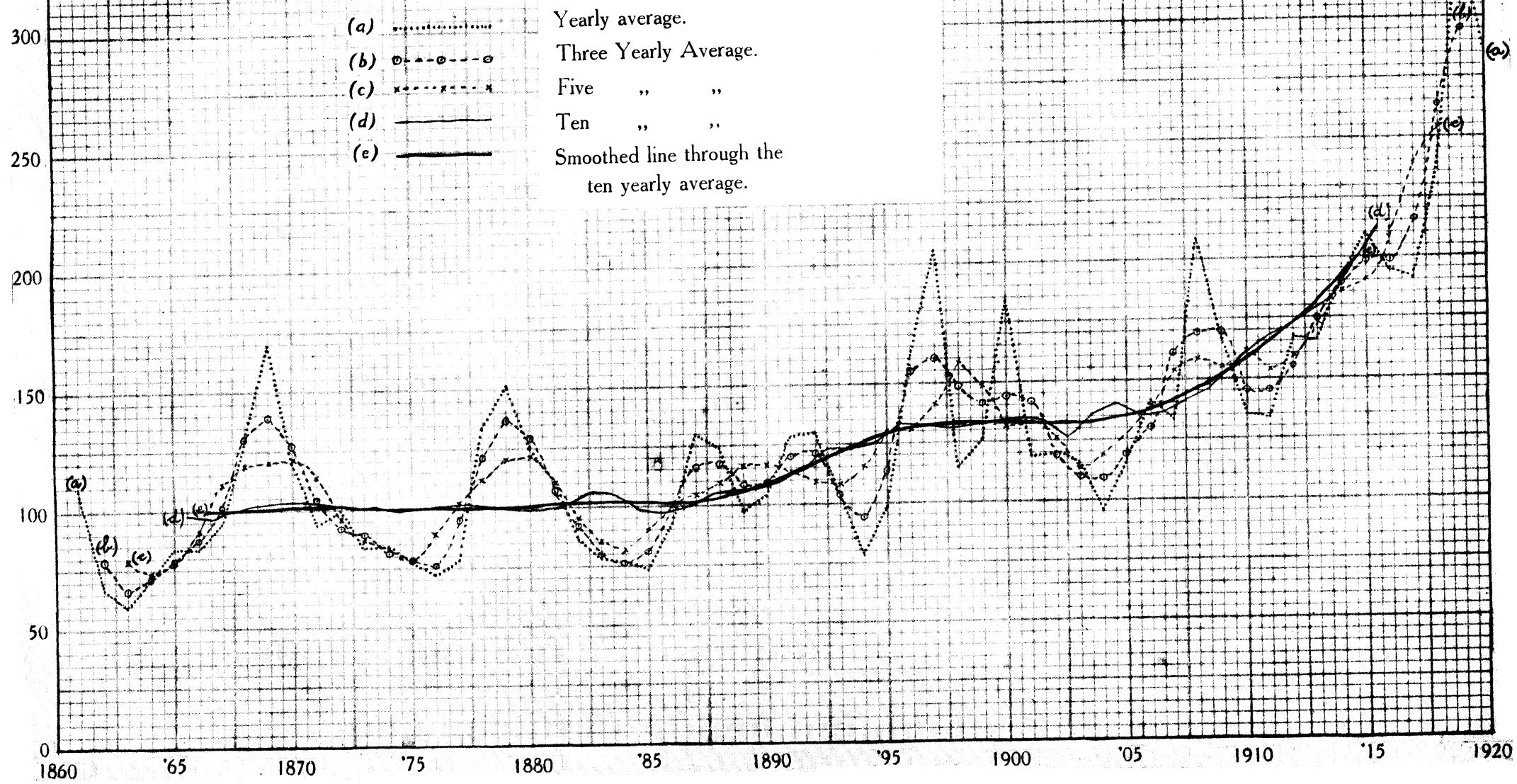
4. Fourthly, the rapid rise in the *general* level which began about 1905, and which seems still in operation as far as our figures take us, viz, 1920.

To offer an adequate explanation of these phenomena is a more difficult problem. If we are right in supposing that the cycle of

(1) I have confined my survey to commodities for which I could get reliable quotations of prices for the Province taken as a whole, viz., wheat, barley, bajra, jowar and gram. To that extent my survey is of a limited nature, and may be attacked on the grounds that the commodities selected are not representative. In a statistical survey, however, it is better to work from a limited mass of fairly reliable data, than from a much larger mass of which the accuracy is more doubtful.

My observations, however, bring me to a conclusion diametrically opposed to that generally accepted, and which is arrived at in an entirely different way by Professor Brij Narain in his "Essays on Indian Economic Problems". In an Essay on "Prices before 1861", after a survey of different Settlement Reports, he comes to this conclusion—"Prices continued to be low till about 1860, after which they began to rise. For the first two or three years after 1860 the rise was due to famine, as also in 1868-69, but it is broadly true that after 1865 prices show a marked upward tendency." (p. 60). Again on p. 67, he says, "To sum up: There are two chief features in the early history of our prices (*i. e.* Panjab prices), the heavy fall of prices in the first three years after the annexation of the Panjab, and the *gradual rise of prices since 1860.*" Again on the same page he speaks of "*the rise in the price of agricultural produce . . . after 1860.*" (The italics in each case are mine). The conclusion is arrived at after a review of various Settlement Reports. He finds himself called upon to account for this rise in prices. The phenomenon brought out by my statistical survey is the reverse of that stated above, viz, the remarkable stability of the *general* level of food prices in the Panjab from 1861 to 1887.

SMOOTHED CURVE OF PUNJAB FOOD PRICES.



high and low prices runs its course in about ten years, it is obviously futile to attempt to explain the rise in the general level that has taken place since 1887 by any enumeration of good and bad seasons. It seems much more likely that it is connected with the improvement of communications in the Province, and the linking up of its markets with those of the West. Such an event would naturally tend to bring the price level in India nearer equality to that of the West. But such an Index Number as that of Sauerbeck's shows the general level of prices in England falling till 1896, after which it tended to rise. In the Panjab, so far as food-grains were concerned, the reverse is seen to be the case. The price level rose till 1896 while in England it was falling; once it started to rise in England, a period of comparative stability set in in the Panjab.

We are, therefore, forced to look for some cause of a general nature which was peculiar to the Panjab, or at least to India, as opposed to England. The cause to which the economist naturally turns, and one over which the business man is generally very sceptical, is the quantity of money in circulation. The business man, if he is, say, a dealer in wheat is so much accustomed to study particular causes—a failure in the monsoon in some other part of India, a shortage in the supply within the Province, the abundance or otherwise of the American wheat crop, etc.—that he is inclined to treat with scorn the influence of a general cause such as the increase of currency in circulation. Have we not all met the successful business man, the man who has done well and is the reverse of a fool, who, perhaps out of deference to the economist, will in a general sort of a way recognise that there may be some connection between the volume of currency in circulation and the general level of prices; but who, at the same time, confesses himself utterly unable to grasp the fact that there can possibly be any connection between the volume of currency and the prices of the commodities in which *he* deals? Yet such general causes are quite well known and universally recognised in other spheres of life. The mean level of the water in an inland lake may be presumed to be the same when it is smooth as a mill-pond, and some eight hours later when a hurricane is raging and mighty waves have formed. Against the crest of the wave must be set the trough, and the mean level will be approximately the same. But if for the

inland lake we substitute a harbour by the sea, and make the same assumptions, it would be exceptional if the mean level were the same at two times eight hours apart. And why? Because in this case an influence of a *general* nature, namely, the tide, had been silently operating, and may have exercised a much greater influence on the mean level than the waves which have arisen on the surface. Of such a nature is the influence of the quantity of money in circulation on the general level of prices.

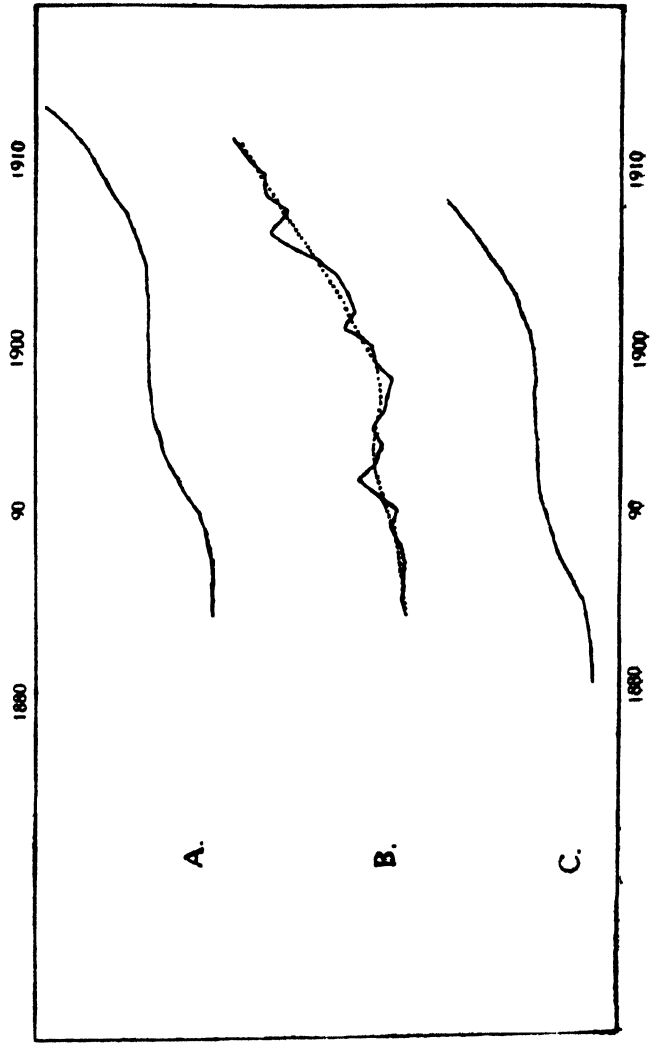
The economic student who looks at our smoothed curve of food prices is almost certain to recall the great imports of silver which set in after the demonetization of that metal in the early seventies by Germany and the United States, and the depreciation of that metal in terms of gold. He will recall the financial difficulties of the Government of India which led eventually in 1893 to the closing of the Indian Mints to the free coinage of silver, and *a priori* he may look for a reflection of these alterations in the price level. He may find indications of what he seeks in the rising price level from 1887 to 1896, and in the period of comparative stability from 1896 to 1905.

The correlation of the general price level of food grains in the Panjab with the amount of currency in circulation in the Province, is, however, a problem of considerable difficulty. The writer knows of no figures which even attempt to give an estimate of the total amount of currency in circulation in the Province year by year, and the Currency Office in Lahore confesses itself unable to help. Even the total amount of currency in circulation in India in different years is a matter of conjecture, and different estimates show considerable discrepancies. I suggest borrowing the estimate given by Mr. Datta in his "Inquiry into Prices in India" (1). He gives a table showing the estimated total amount of currency (including currency notes) in circulation in India from the year 1884 to 1912. If we make the assumption, and it is rather a big one, that any increase or decrease of currency in circulation in India will reflect itself proportionately in the Panjab, we may take the figures given by Mr. Datta, and compare them with the general price level we have established.

(1) For the method in which the figures were arrived at see Datta "Inquiry into Prices in India", p. 92.

DIAGRAM VI

- SHOWING
- A. SMOOTHED CURVE OF PUNJAB FOOD PRICES.
 - B (i). ——— TOTAL AMOUNT OF CURRENCY IN CIRCULATION.
 - (ii). SMOOTHED CURVE OF SAME.
 - C. SMOOTHED CURVE OF PUNJAB FOOD PRICES PLOTTED WITH A 5 YEARS' LAG.



A diagram has been prepared showing :—

- (1) the smoothed curve of Panjab food prices,
- (2) the amount of currency in circulation (as given by Datta),
- (3) the smoothed curve of Panjab food prices plotted to make allowance for a five-years lag.

If curve (1) be compared with curve (2), a fairly close resemblance is noticeable. The main point of difference is that, while the form of the two curves is largely similar, the variations in curve (2) lag behind those in curve (1). For purposes of comparison, curve (1) has been plotted a second time as curve (3), but in this case the figures have been put forward five years.

To the economic student the close resemblance of these curves is more than a coincidence. The rising flood of the currency in circulation till 1892, the fall after that date until 1898, and the rise from then onwards all have their counterpart in our smoothed curve of prices, though the latter seems to lag a few years behind. But to attempt anything more than the suggestion of the relationship would necessitate a complete paper to itself.

PERIODICITY IN PANJAB FOOD PRICES

It has been suggested previously that the figures given by the three-yearly, five-yearly and seven-yearly averages seem to indicate fairly clearly a well-defined cycle of high and low prices, the period of which is about ten years. This point may now be taken up more fully.

The maximum points as given by each of these averages are set out below :—

Three-yearly	Five-yearly	Seven-yearly
1869	1870	1869-1870
1879	1880	1880-1881
1888	1889 & 1890	1890
(1892	..	1894)
1897	1898	1899
..	..	1903)
1908	1908 & 1910	..
(¹)	(¹)	(¹)

(1) Figures are not yet available to enable us to construct such averages at the end of the period, but the presumption is that a similar maximum turning point will be found somewhere between 1919 and 1921.

In the above, there are certain discrepancies, but on the whole the fact seems to be well established that during the period 1861 to 1920, there has been a most pronounced tendency for high prices to prevail, so far as Panjab food prices are concerned, when the figure in the decennium is about to change. The entry 1892 under the three-yearly average may be said to be due to a short-period fluctuation which a three-yearly average is too short to eliminate—at this time we had a “double peak”. The entries 1894 and 1903 under the seven-yearly average, both of which may be regarded as exceptional, can easily be explained. Both of these were years of very low prices, but the period of seven years is sufficiently long to embrace the falling prices from one maximum, and the rising prices to another, and thus in these cases years of actual low prices have appeared as maximum turning points.

If we delete these exceptional cases, and summarise the remainder, we arrive at the following:—

Maximum Turning Points

Number of occasions where the digit was:—

1	2	3	4	5	6	7	8	9	0
$\frac{1}{2}$	0	0	0	0	0	1	$2\frac{1}{2}$	5	5

(NOTE.—Where two years appear under the maximum, *e. g.*, 1869 & 1870 in the first entry in the seven-yearly column, each has been entered as $\frac{1}{2}$.)

The ten-yearly average shows considerable deviations, and in many cases gives the maximum in the wrong place. But if the ten-yearly period is granted, this discrepancy is to be expected. Economic laws differ from the laws of the natural sciences in that they merely express tendencies which will occur in the absence of disturbing causes. In Astronomy, for example, once the path of a particular star, and the rate at which it travels, have been determined, its position at any time in the future can be foretold with almost mathematical accuracy. But all kind of counteracting influences may intervene to upset the working of economic laws. An increase in the quantity of money in circulation within a country might be expected, other things remaining the same, to raise the general level of prices, but the volume of trade might increase, the rapidity of circulation might decrease, and various other influences

intervene to neutralise the influence of the increase in quantity. So, as regards the recurrence of any particular economic phenomenon, whether it be a period of trade depression or an era of high prices, though the period in general may be perfectly well-defined, it may at any time be upset by altogether unforeseen circumstances. The tendency may be for high prices to recur in the Panjab every ten years, but that tendency may on any particular occasion be accelerated or checked by circumstances of an exceptional nature. The period, instead of being ten, might be nine or eight. In that case it must be obvious that a ten-yearly average may give altogether unexpected results, for it may bring the period of maximum when prices actually were at their lowest between the two points of maxima.

The minimum turning points as given by the three-yearly, five-yearly and seven-yearly averages give results equally significant to those of the maximum. The following table gives the minimum turning points :—

Three-yearly.	Five-yearly.	Seven-yearly.
(1863	1864	1864)*
1876	1875	1874
1884	1884	1883
1894	1893	1892
1904	1903	1904
1910 & 1911	1911	1912**

* Not altogether reliable as the earlier figures necessary are not available.

** No fall, but rise apparently checked.

If these figures be summarised in the same way as before, we get the following :—

Minimum Turning Points.

Number of occasions where digit was :—

1	2	3	4	5	6	7	8	9	0
1½	2	4	8	1	1	0	0	0	½

Where we take the two summaries side by side, they seem to warrant the conclusion that during the past sixty years the tendency has been unmistakable for an era of low prices to prevail in the

Panjab so far as food-grains were concerned around the year with the digit 4, and for an era of high prices to prevail when the digit was 9 or 0. This is a study of what has been, and not of what is to be in the future. We refuse to be led into the field of prophesy; suffice it to say that the decade in which we live bids fair at the moment to run a similar cycle. The year 1924 has certainly witnessed a very great decline from the high prices which prevailed from 1919 to 1921.

If we are correct in our surmise that high and low prices tend to recur every ten years, then we should get a curve of a somewhat regular nature if we total the percentage figures for the digit 1, for the digit 2, etc. This has been done in Table XIII below:—

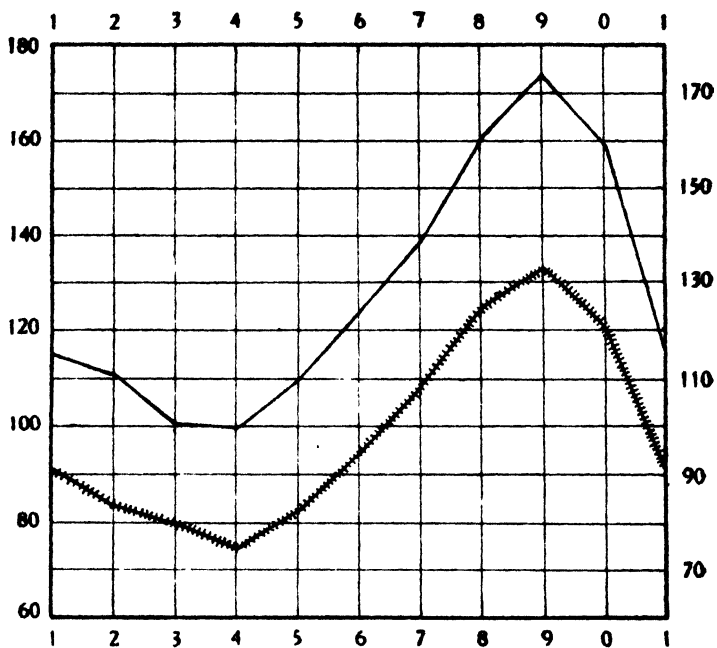
TABLE XIII.

Percentage when digit is :—

Year	1	2	3	4	5	6	7	8	9	0
186—	109	67	59	71	83	83	94	126	169	119
187—	93	100	82	84	77	72	78	134	151	125
188—	111	86	78	77	74	93	130	124	97	103
189—	128	130	105	78	99	161	205	114	126	184
190—	118	120	115	95	117	141	133	209	166	135
191—	133	167	166	191	210	194	191	263	336	286
	6/692	670	605	596	660	744	831	970	1045	952
	115.	112	101	99	110	124	138	162	174	159

This table shows a tendency for prices to be at their lowest in the year with the digit 4, and at their highest in the year with the digit 9. This method of procedure is, however, subject to one great objection, in that the percentage figures in the last decade are very much higher than in the first and as a consequence they exercise a much greater weight on the result, whereas we should like the figures of each decade to exercise the same influence. This difficulty may be overcome by totalling the figures in each line and then expressing each particular figure in the line as a percentage of this total. This has been done below in Table XIV,

DIAGRAM VII
AVERAGE PERCENTAGE
PRICE WHEN DIGIT IS



————— Not Adjusted.

..... Adjusted.

TABLE XIV.

FIGURES OF TABLE XIII ADJUSTED, SO THAT EACH LINE
TOTALS 1,000.

Percentage when digit is:—

Year	1	2	3	4	5	6	7	8	9	0
186—	111	68	60	72	85	85	96	129	173	122
187—	93	100	82	84	77	72	78	134	151	125
188—	114	88	80	79	76	96	134	128	100	106
189—	77	96	98	59	74	121	154	86	95	138
190—	87	89	85	70	87	105	99	155	123	100
191—	63	62	78	89	98	91	89	123	157	134
	<u>6/545</u>	<u>503</u>	<u>483</u>	<u>453</u>	<u>497</u>	<u>570</u>	<u>650</u>	<u>755</u>	<u>799</u>	<u>725</u>
	91	84	80	75	83	95	108	126	133	121

The results arrived at when the figures are adjusted in this way are not very dissimilar in their results from those given by Table XIII—a result to be anticipated if the figures in the latter decades are due to general influences which are as pronounced in the first years as in the last of the decade. Again a clearly defined minimum is observable when the digit is 4. In this case the maximum is clearly found when the digit is 9.

The figures arrived at in Table XIII and in Table XIV have been presented graphically, and the diagram illustrates even more clearly what has been said above. One point that seems borne out by it is that the descent from a period of high prices is more rapid than the ascent, but this we do not stress, nor do we at present attempt to explain it.

To sum up our observations on periodicity we may say:—

1. that from a review of the years for which we have definite information a cycle seems well established ;
2. that the length of that cycle would appear to be ten years;
3. that the tendency has been for an era of high prices to prevail about the end of each decade, and the year when it

has in general been at a maximum has been that with the digit 9;

4. that an era of lower prices usually set in with each new decade, and the tendency has been for prices to reach a minimum in the year with the digit 4 ;
5. that influences of a non-periodic nature have at times upset the regularity of the cycle, but of its existence there seems little doubt ;
6. that the tendency in the present decade seems to be in harmony with the general trend outlined above.



