

ORGANISATION OF STATISTICS IN THE POST-WAR PERIOD.

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The war has shown an increasing need of statistics in every direction; the need will be even greater in the post-war period which cannot be very far off. Hostilities may cease in a year or two; this is likely to be followed by two or three years of demobilisation or transition from war to peace phase; we should be then ready to begin the long-range programme of reconstruction.

NEED OF PLANNING.

2. Now statistics in order to be of any practical use must be accurate, adequate and available at the proper time. All three are equally important. To secure these three A's of statistical science—accuracy, adequacy and availability—careful planning is indispensable. This means that collection of statistics should start well in advance of the time when these will be actually used. Statistics is something like an orchard or even a forest; we have to plant well in advance. For accuracy in collection it is essential to build up an efficient human organisation with carefully selected and trained staff. This takes time. And unless such time is allowed the results are often not only useless, but even harmful, as these lead to action opposite to that called for in the real situation. The first point, which I therefore wish to stress, is that the organisation of statistics for the post-war period must begin here and now.

STATISTICS RELATING TO RICE IN BENGAL.

3. In India unfortunately collection of statistics often starts when it is usually too late with tragic consequences. Let us consider the question of the supply of rice in Bengal as a typical example. In Calcutta today it is not necessary to stress its importance.¹ However, the first thing that strikes us is the lack of reliable statistics on every side. How many persons have we to feed? In 1941 the total population in Bengal was about 61.5 millions, but the accuracy of this Census figure has been questioned. What is the annual increase in population? We do not know. Statistics of births and deaths are untrustworthy, and have never tallied with Census figures. Between 1931 and 1941 the population apparently increased by more than one million (or ten lakhs of persons) per year on an average, while the average increase between 1872 and 1941 was about three lakhs of persons per year; the truth probably lies somewhere between these two limits.² What is the consumption of rice per head? We have no data but only vague estimates ranging from less than 4 maunds (= 329 lbs.) to 6 maunds (= 494 lbs.) of rice³ per head per year—all, of course, based on personal impressions.

4. How much rice do we grow or can we grow? According to official estimates about 23 crores of maunds⁴ (about 84 lakhs of tons) on an average during the last 20 years; but official figures (given in Table 1 of the Appendix) have been long known to be

¹ According to *The Statesman* of 13th November, 1943, of Calcutta the number of admissions of starvation cases to hospitals in Calcutta alone was 13,967 between August 16 and November 10, and the number of deaths among these 4,825. Bodies disposed of by Corpse Disposal Organisations were 7,635 and total deaths among 'paupers' recorded by the City Corporation Health Officer were 13,614 between August 1 and November 6.

² The actual Census figures were 34,691,799 (1872); 37,020,563 (1881); 39,812,265 (1891); 44,888,194 (1901); 46,312,262 (1911); 47,599,233 (1921); 51,087,338 (1931); and 61,460,377 (1941).

³ All figures are given in terms of clean rice (not in husk) which is usually taken as two-thirds by weight of paddy (in husk).

⁴ One ton = 27.23 maunds; one million = 10 lakhs; one crore = 100 lakhs = 10 millions.

unreliable and may be wrong by even 20 or 25%.⁵ How much rice do we secure from outside Bengal? Here we have (or rather had for a small number of years) reliable figures relating to sea and rail-borne trade. The net import was usually small and was on an average something like 22 lakhs of maunds or about 1% of the total production during the seven years from 1933-34 to 1938-39 for which figures are given in Table 2 of the Appendix; it was highest and just short of one crore maunds (3.6 lakhs of tons) or less than 5% of total production in 1934-35. We have, however, no reliable statistics relating to the amount of rice which comes into the province by road or river; this is usually believed to be small, but on what grounds I do not know. Statistics of movements of grain from one part of the province to another or other trade statistics relating to conditions within the province are not available.

5. As regards other cereals we grow or import very little. Wheat is the most important grain next to rice, but the total quantity grown is only about 30,000 tons, and we import about 200,000 tons (which makes about 2.3 lakhs of tons in all or less than 3% of the total production of rice). We have fairly reliable statistics about prices, but only very rough ideas about the cost of cultivation. The most noteworthy fact about the price of rice is that it remained comparatively stable over long periods, and apparently has little or no connection with the total production in the province as given in official estimates.

6. One thing, of course, we do know. The supply is not enough. The average deficit has been estimated by a distinguished administrator⁶ at such a high figure as over ten crores of maunds (nearly 4 million tons) per year which is nearly half as much as the total production during the period of 25 years from 1911-12 to 1936-37. In any case, even if we accept the very low figure of 4 maunds per head per year⁷ and if the annual increase in population is about ten lakhs, then the increase in supply must be at least 40 lakhs of maunds (1.6 lakhs of tons) per year merely to maintain the existing level of consumption; even if the annual increase in population is so low as three lakhs per year, the additional quantity required would be 12 lakhs of maunds (about 50,000 tons) per year. We thus have not only a chronic but a growing shortage of rice in Bengal. That this has not influenced in any marked degree either price movements or net imports may probably be explained by the fact the bulk of the people often have to go without enough food simply because they cannot afford the money to purchase it.⁸

7. Let me consider briefly the question of growing more food. Here also we have very little data to build upon. The area under rice is not known accurately; neither do we know how much land can be brought under rice, as official data relating to marginal land are meagre and thoroughly unreliable. Yield figures are also extremely uncertain.⁹ We have little or no knowledge of the increase in yield which may be reasonably expected under existing field conditions¹⁰ by the use of manures, irrigation or improved methods of cultivation.

⁵ Official rice estimates have actually differed by more than 23% on an average from Settlement figures which are usually believed to be reliable.

⁶ The Hon'ble Sir Azizul Haque in *Man Behind the Plough*, 1939, p. 54.

⁷ The figure 344 lbs. (= 4.18 maunds) per head per year was given as the rate of consumption of rice in Bengal in the *Report on the Marketing of Rice in India* (Government of India, 1941, p. 534) and has been, I believe, adopted as a standard figure by Government departments in recent months. Dr. Aykroyd of the Coonoor Nutrition Laboratory is reported to have stated that one pound of cereal per day or 365 lbs. (= 4.44 maunds) *per capita* per year is the minimum requirement in India.

⁸ Burma was certainly a stabilising factor so far as price is concerned, as it prevented attempts at hoarding or cornering; but as I have already pointed out, the total physical quantity of net import was never large and did not exceed, as far as we know, 5% of the total production in any single year.

⁹ A fuller discussion of official estimates is given in the Appendix.

¹⁰ In order to prevent any misconception I should like to make it clear that the emphasis here is on 'existing field conditions'. We know that in pot cultures or under controlled conditions in research stations or experimental farms the use of ordinary manures or chemical fertilisers does give an appreciable or even large increase in the yield of paddy, but how far this is true of cultivator's fields on a large scale is doubtful. From what little data I have had the opportunity of examining I gathered the impression that in many parts of Bengal manuring does not seem to be a factor of importance especially if the supply of water is adequate. It may be that under existing conditions of cultivation

8. This is the position about rice—the one most important commodity in Bengal. No reliable statistics relating to either production, consumption, or stock of rice was available. In this situation when prices began to go up at first gradually¹¹ in 1942 and then precipitously from early 1943, it was quite impossible to judge to what extent the present crisis was due (a) to actual physical shortage of rice, or (b) to failure of distribution arising from the withholding of the marketable surplus by hoarding and/or profiteering. Appropriate administrative measures could only have been taken on a correct appreciation of the relative magnitude of shortage and hoarding. In the absence of reliable statistics both official and non-official opinion oscillated violently from time to time between the two alternative hypotheses of (a) shortage, and (b) hoarding. I am aware, of course, that statistics would not have increased the supply. But, and this is the point to be emphasised, reliable statistics would have made it possible to take precautionary measures in advance; prevented the adoption of futile administrative policies; and, finally, enabled the 'Grow More Food' campaign being planned on scientific lines.

THE FOOD CRISIS IN BENGAL.

9. Let us consider a little more closely the actual course of events during the preceding 12 months. The expected outturn of Aus (autumn) paddy was about 4.62 crores of maunds (1.69 million tons) according to the official estimate issued by the Bengal Director of Agriculture on the 3rd October, 1942. This was slightly below the average crop. On the 5th October the Director of Agriculture issued the first official forecast of the winter rice crop in Bengal in which he gave the area as 16,103,200 acres and the reported outturn as 78%, but added that he expected 'a 10-anna outturn for the province as a whole'. With an official 'normal' yield of 12.4 maunds per acre the estimated production was thus about 57 lakhs of tons on the basis of reports received and 46 lakhs of tons in the opinion of the Director of Agriculture himself. The final revised estimate of total production in the preceding year (1941-42) was 7,396,400 tons and the average of preceding ten years was 6,290,600 tons. It was thus considered likely that the main (winter) rice crop in 1942-43 would fall short of the last season's crop by 22.8% according to reports received or by 38.1% in the opinion of the Director of Agriculture himself. In the second official forecast issued in December 1942 the expected outturn was given as 5,380,600 tons representing a shortage of over two million tons or 27.2% on last year's production and a shortage of 9.1 lakhs or nearly one million tons on the ten-year average. In the third final forecast issued on the 13th February, 1943, the outturn was given as 5,020,100 tons which fell short by 2,376,300 tons (32.1%) on the preceding season's crop and by 1,270,500 tons (20.2%) on the ten-year average. The total expected outturn inclusive of Aman (winter), Aus (autumn) and a negligible quantity of Boro (summer) rice was 18.86 crores of maunds (69.16 lakhs of tons) which fell short of the ten-year average by about one-sixth—quite a large amount in view of the cessation of imports from Burma, and increasing transport and other difficulties arising from the war situation.

LACK OF CONFIDENCE IN OFFICIAL STATISTICS.

10. We thus find that since October 1942 the official estimates clearly indicated a large deficit; and yet we know that the position was not considered serious by Government. The official estimates were evidently disbelieved by the very Government which issued them. The reason is not far to seek. Agricultural statistics in India,

(in which the standing water forms large pools covering whole villages or groups of villages) a good part of the manure is washed out and its effect is spread over not merely the plots actually treated with manure, but also over a large number of surrounding plots the water in which is in drainage communication. If this surmise is correct then manuring on a massive scale in the required concentration covering whole villages may be necessary to produce tangible results; this question deserves careful study.

¹¹ Typical prices are given in the Appendix.

especially those relating to Bengal and other permanently settled areas, have been long known to be thoroughly unreliable. The Royal Commission on Agriculture (1928) under the chairmanship of Lord Linlithgow himself was of opinion that these 'are admittedly often mere guesses and are not infrequently demonstrately absurd guesses'.¹² Dr. A. E. Bowley and Mr. D. H. Robertson thought 'the annual statistics of area to be almost worthless'.¹³ The Bengal Paddy Enquiry Committee (1938) fully endorsed these views; and speaking of crop estimates expressed the opinion that these were least developed and least dependable of all agricultural statistics in Bengal.¹⁴ The Bengal Land Revenue Commission (1940) observed that 'no dependable statistics existed in Bengal . . . to show the yield of the various crops'¹⁵ and quoted the complaint made in 1876 by MacDonnell who had commented on 'what has been held to be a great want to an administrator in Bengal, the want of agricultural statistics'.¹⁶

11. It is not surprising, therefore, that in spite of the alarming nature of the official rice forecast the Government of Bengal took no notice of it, and even so late as December 1942 did not make any attempt to secure additional supply from outside the province and thought price control to be entirely unnecessary.¹⁷ In fact, the official estimate had been quite low on several occasions in previous years, for example, in 1913-14, 1914-15, 1918-19, 1926-27, 1927-28, 1935-36, and in 1940-41, only two years earlier, was only 16.48 crores of maunds (60.43 lakhs of tons) which was much lower than the estimate for 1942-43 and fell short of the ten-year average by nearly 27%, and yet nothing untoward had happened. It was, therefore, not unnatural on the part of the Government of Bengal to take the view that the official estimate for 1942-43 was unduly pessimistic as on many previous occasions. The cry of wolf had been so often raised in vain in the past that it was not surprising that every one was caught unawares when the wolf really did come.

LACK OF ATTEMPTS AT IMPROVEMENT OF STATISTICS.

12. It was not merely the Government of Bengal but the Government of India also which failed to take notice of the seriousness of the position. As I have already pointed out, in view of the known unreliability of official estimates, this was not unnatural. What is to be really regretted is that in spite of strong and unequivocal condemnation of existing crop statistics by a series of most authoritative Committees and Commissions from 1876 to 1940, no steps whatsoever had been taken, even in the period of grave war emergency, to improve the collection of statistics relating to rice. More than seven years ago, in March 1936, I had suggested in a letter to a high official in Delhi that a small grant of Rs.10,000 might be sanctioned to explore the possibilities of the sampling method for improving the crop statistics of Bengal. In 1937, at the instance of the Indian Central Jute Committee, work was started under my guidance on a five-year scheme at a cost of five lakhs of rupees for the improvement of jute statistics; and I had pleaded from the very beginning for including work on paddy along with jute at the marginal cost of a few thousand rupees. Prof. R. A. Fisher supported my proposals, and in a Memorandum to the Government of India in 1938 stated that 'in the economic aspects of agriculture, the most obvious line of progress now suggested is the development of the sampling method (which) . . . is capable at *very trifling expense*, of ascertaining with more than the necessary precision such facts as the actual yield in a district or province, of any chosen agricultural crop'. I repeated the proposal for starting work on the paddy crop year after year in 1939, in 1940 and again in 1941. On the 28th March, 1942, I submitted to a high official in the Government of India a definite scheme for the survey of paddy

¹² Report, p. 605.

¹³ *Report on a Scheme for an Economic Census of India*, 1934, pp. 35-39.

¹⁴ Report, Vol. 1, p. 88.

¹⁵ Report, Vol. 1, p. 76.

¹⁶ *Report on the Food-grain Supply of Bengal and Bihar*. Introduction, p. iii.

¹⁷ The situation had, however, deteriorated so much by February 1943 that the same Government officially announced a large shortage of rice in a statement made before the Legislative Assembly, evidently on the basis of the already available official estimate as no fresh information had been collected.

in Bengal and Bihar. Between July and October 1942 I wrote several letters to Bengal officials urging to the best of my ability the immediate taking up of a rice census in the province but to no avail. Early in 1943 I renewed my efforts but without success for a long time. I am glad to state, however, that at the last moment in August 1943 orders were issued at the instance of the Hon'ble Mr. H. S. Suhrawardy for a survey of the paddy crop in Bengal for the first time on scientific lines.

DANGER OF EXCESSIVE HASTE.

13. Government circles in New Delhi as well as in Bengal have, of course, by this time realised that accurate statistics is the first thing necessary for handling the food problem in Bengal. In fact, they have burnt their fingers so badly for lack of reliable statistics that there is every danger of the pendulum swinging too far to the other side and panic measures being adopted which would prove not only useless but positively harmful. The danger now is not lack of funds but too much money. People who until recently were not prepared to spend a few thousands are now eager to sanction as many lakhs of rupees for the collection of crop statistics, and I believe schemes for complete plot-to-plot census on the grand scale are being seriously considered. Giving an excess of food all on a sudden to the famine-stricken usually proves fatal, and results may prove equally disastrous in the case of statistics. For it is not possible to call for statistics and get these at a moment's notice by issuing an administrative fiat. Or rather I should say that, although it is always possible in this country to get some kind or other of statistics by executive order, in most cases such statistics are likely to be entirely worthless.

14. It must be remembered that statistics to be reliable can be best collected as a by-product. As soon as any matter becomes controversial or involves vested interests it becomes difficult and often impossible to collect reliable information. We have a classic example in the case of jute. In 1939 an attempt was made to carry out a complete or plot-by-plot census of the acreage under jute in Bengal (with a view to the introduction of a system of licences permitting the growing of jute). The results were so untrustworthy that, although several lakhs of rupees had been spent in this attempt, the Government of Bengal decided to destroy the whole material. At my request records for several districts were sent to me; and I found that in certain cases the acreage under jute had exceeded the total geographical area of the region, so fantastically had the figures been exaggerated! This furnishes no doubt a good example of the well-known saying: 'white lies, black lies, and—statistics'. But to any experienced statistical worker the results can cause no surprise; in fact, they were just what were to be expected. In view of the impending introduction of the jute regulation scheme every cultivator wanted to register as high a figure for jute as he thought was likely to be accepted by the investigators.

15. In fact, under abnormal conditions statistics collected through usual administrative agencies is likely to become tendencious. For example, in 1940-41 just before the introduction of the jute regulation scheme the official forecast gave 33·90 lakhs of acre against, as it turned out later, an actual final figure of 49·39 lakhs of acre. The revised figure was thus higher by 15·49 lakhs of acre (or 46% of the original estimate of 33·90 lakhs of acre!). After a 'Grow More Food' campaign estimates are, on the other hand, likely to rise steeply to prove the effectiveness of Government policy which, however, may not have any relation to actual cultivation conditions.

16. Statistics relating to any controversial issue are likely to be heavily biased. As rice has now become a matter of conflicting interests it is almost certain that any attempt at a direct plot-by-plot census will fail at the present time. Figures for production would be heavily under-estimated while those for consumption would be grossly exaggerated. Not only this; such an attempt is likely to meet with considerable psychological resistance from cultivators, and may easily lead to the field investigators putting down figures by guess work instead of by actual field survey.

17. This brings me to a most important point, namely, the human factor in the collection of primary statistics. I have learnt by bitter experience the difficulty of securing reliable primary investigators. In the course of our work on jute acreage we made careful

experiments in this matter in 1937 and 1938. We had plot-by-plot enumeration carried out independently in the same area by three or four sets of different investigators. The results were amazing. We found that the absolute discrepancy¹⁸ was of the order of 70 or 80%. In these experiments we had employed only about 60 or 65 field workers. In a full-scale provincial surveys the total staff required would be something like six thousand or hundred times larger, and the difficulty of ensuring accuracy of primary enumeration can be easily imagined. This indeed is the great snag in a complete census. The results would be perfect only if it could be successfully carried out. But, owing to the unreliability of the human factor, this can be never attained in practice. Not only this; it is not possible to ascertain whether the work has been carried out accurately or not. Once a mistake occurs in a complete census it can neither be detected nor rectified.

18. In this situation the sample survey offers distinct advantages. In the case of crop statistics it can easily give final results with an error not exceeding 2 or 3%¹⁹ which is good enough for all practical purposes. In fact, a complete census would be much less reliable in actual practice under existing conditions. Secondly, in a sample survey it is possible to set up statistical controls at the point of collection of the primary material. This makes it possible to obtain an objective measure of the margin of error. Thirdly, the number of field workers needed for a sample survey is only a small fraction (usually less than 10%) of that required for a complete census. It is, therefore, much easier to select suitable men, give them necessary training, and generally to maintain a higher standard of work. Finally, a sample survey is more economical and can be carried out at something like one-twentieth part of the cost of a complete census. In the case of crop statistics I, therefore, submit that the wisest policy would be to hasten slowly.

CONCLUSION.

19. Statistics is essentially a long-range undertaking, and the primary need is to lay the foundation on sound lines. Lavish expenditure by itself will not mean progress; on the contrary, may lead to serious setbacks. The greatest danger in statistics is alternate periods of starvation and excessive expenditure in a hurry. We must guard against both; and the only wise policy would be to provide adequate funds for carefully planned and orderly progress. The famine in Bengal has shown how unprepared we were. A Bengali proverb says that it is easy to be wise after the thief has run away. But in this case the thief can come again next year or the year after. So why not be wise and take precautionary measures in good time? I plead, therefore, for the taking in hand, without any further delay, the building up of the statistical organisation which is essential for post-war reconstruction.

20. There is, however, need for caution. Statistics runs a grave and peculiar danger from which other sciences are immune. If an administrator wants to put up a building he decides what kind of accommodation is required and what should be the expenditure; if he wants to use a vaccine on a large scale for public health purposes he decides what quantity should be prepared; if he wants chemical fertilisers he decides how much should be produced; and then leaves it to the engineer, the bacteriologist, or the chemist to get the thing done. He would never dream of preparing the detailed specifications or decide intricate questions of production. In India, unfortunately in statistical matters, there is still a tendency among administrators not to remain content with formulating the requirements but also to decide technical questions of procedure. This is due, no doubt, to the fact that statistics in India has remained until recently a virtual monopoly of officials and administrators. But the time has come to recognise that statistical science has now become as highly specialised a subject as engineering, medicine, or chemistry. The administrator should formulate his requirements and leave it to the

¹⁸ That is, ignoring algebraic sign.

¹⁹ This point was carefully tested in 1941 at the end of a five-year scheme for the improvement of the jute forecast in Bengal. A general account has been given in the presidential address to the Section of Mathematics and Statistics on *Sample Surveys* at the Baroda Session of the Indian Science Congress in 1942.

statistician to devise appropriate methods. The help of experts must be availed of in statistical matters as freely as in other technical subjects. A Standing Committee for Statistics may prove most useful in this connection, and I believe the National Institute of Sciences can help effectively by giving its powerful support to get such a Committee appointed at an early date.

APPENDIX.

Official Statistics relating to Rice in Bengal.

Certain items of statistics compiled from official publication are given in Table I for 1922-23 to 1942-43. The primary figures relating to area under paddy in lakhs of acres given in column (2), and the outturn of rice (not in husk) in lakhs of tons in column (3) are based on the estimates prepared by the Director of Agriculture, Bengal, which are later incorporated in various official publications. The yield in lbs. per acre given in column (4) are merely average figures calculated by dividing the figure in column (3) by the corresponding figure in column (2) and do not supply any new information.

2. The population figures given in column (5) have been obtained by simple linear interpolation between decennial Census figures (which are marked with stars) as finer refinements are unnecessary for present purposes. The *per capita* area under rice and the *per capita* production are given in columns (6) and (7) respectively, and are merely calculated figures. The average annual price of rice (not in husk) in rupees per maund

TABLE I.

Official Estimates relating to Rice in Bengal.

Year.	Area in lakhs of acres.	Outturn in lakhs of tons.	Average yield in lbs. per acre.	Interpolated population in lakhs.	Per capita		Price of rice in rupees per maund.	Calculated surplus or deficit in lakhs of tons.
					Area under paddy in acre.	Production in lbs. per year.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1922-23	217.7	90.50	933	479.5	0.45	424	5.5	+13.10
1923-24	203.6	75.09	829	483.0	0.42	349	5.5	- 2.84
1924-25	208.8	77.11	830	486.5	0.43	355	6.4	- 1.36
1925-26	211.3	82.18	872	489.9	0.43	376	7.0	+ 3.19
1926-27	198.7	73.55	831	493.4	0.40	334	7.2	- 5.98
1927-28	186.8	64.93	780	496.9	0.38	293	7.5	-15.14
1928-29	214.0	96.84	1,015	500.4	0.43	434	6.6	+16.23
1929-30	202.3	82.02	910	503.9	0.40	365	6.0	+ 0.88
1930-31	205.8	92.06	1,004	507.4	0.41	407	6.0	+10.38
1931-32	221.3	94.93	963	510.9	0.43	417	4.1	+12.71
1932-33	217.8	93.64	965	521.2	0.42	403	3.4	+ 9.84
1933-34	216.7	86.80	899	531.6	0.41	366	2.6	+ 1.40
1934-35	207.4	82.73	897	542.0	0.38	342	3.0	- 4.26
1935-36	210.9	72.08	767	552.4	0.38	293	3.3	-16.51
1936-37	219.9	106.68	1,089	562.7	0.39	425	3.5	+16.51
1937-38	222.0	90.34	913	573.1	0.39	354	3.6	- 1.43
1938-39	220.0	75.67	772	583.5	0.38	291	3.6	-17.70
1939-40	222.6	84.55	853	593.9	0.37	319	4.3	-10.42
1940-41	207.7	60.43	653	604.2	0.34	225	5.1	-36.12
1941-42	238.4	98.21	924	614.6	0.39	359	6.7	+ 0.07
1942-43	231.4	69.16	671	624.9	0.37	249	10.8	-30.57
Average (20 yrs.)	212.7	84.01	886	..	0.40	357	5.1	- 2.76

(= 82.28 lbs.) have been compiled from the *Statistical Abstracts for British India* for the period 1922-23 to 1937-38, and for later years from statements of the wholesale price of rice in Calcutta published by the Director-General of Commercial Intelligence; no attempt has been made to attain great accuracy as our object is to give a broad idea of the actual position.

3. A few facts of general interest compiled from the Report of the Bengal Paddy and Rice Enquiry Committee (1940) and other sources are being given here for convenience of reference. The total area under paddy in the whole world is believed to be something of the order of 190 million acres; the area under paddy in Bengal comprising something like 23 million acres, thus constitutes about one-eighth of the world area. Bengal is easily the most important paddy-growing province in British India with a share of about 27% of the total area of about 80 million acres and nearly 30% of the total outturn of about 28 million tons. In British India as a whole the area under paddy forms about 35% of the total cropped area while in Bengal it forms something like 90% of the total net cropped area. Paddy is grown all over the province, and only in the three districts of Darjeeling, Rungpur and Hill Chittagong the acreage is less than 70% of the total net cropped area. It is also worth mentioning that the average area under jute (the most important crop next to paddy) is something like 7 or 8% which is of the order of only one-tenth or less of the area under paddy.

4. *Area and outturn.*—Let us consider the official estimates given in Table 1. For purposes of comparison I am giving at the bottom of the table average values based on the 20 years (1922-23 to 1941-42) preceding 1942-43. The (20-year) average area under paddy was 212.7 lakhs of acres, and the outturn 84 lakhs of tons. The first point to be noted is that there was no steady increase in the available supply of rice along with the growth of population. Secondly, fluctuations in the supply (column 3) are disconcertingly large; for example, it varied from 60 lakhs of tons in 1940-41 to over 107 lakhs in 1936-37, the range being so large as 47 lakhs of tons. From column (2) of Table 1 we notice that the variation in acreage was comparatively small; in fact, most of the variation occurred in the rate of yield per acre.

5. *Net import of rice.*—I am giving in Table 2 the total import, the total export and the net import of rice (not in the husk) in lakhs of tons for the seven years from 1933-34 to 1939-40 for which figures are readily available. As already mentioned in the paper these relate only to sea and rail-borne trade, as no statistics regarding movements by road or boats are available. For convenience of comparison I am quoting in column (5) of Table 2 the figures for total outturn from column (3) of Table 1; the net import is shown as a percentage of the total outturn in column (6). It will be noticed that average net import during these seven years was only about one lakh of tons or about 1% of the average production. The net import was highest in 1934-35, 3.76 lakhs of tons, but even this was only about 4.5% of the total production. This shows that the actual physical quantity brought into the province is comparatively small.

6. *Consumption of rice.*—The figure 344 lbs. has been given as the rate of consumption of rice in Bengal in the *Report on the Marketing of Rice in India* (Government of India, 1941), p. 534. This, I believe, has been widely accepted as a standard figure in Government departments. It is, however, merely a derivative figure obtained by dividing the average official estimate of outturn for the quinquennium ending 1937-38 by the (interpolated) population figure for 1938, and can therefore claim no independent validity. In a pamphlet on the *Supply of Rice in Bengal*, prepared by Mr. N. C. Chakravarti of the Bengal Civil Service and issued by the Board of Economic Enquiry (Publication No. 51(B), 1939), we have various figures for the consumption rate given by different authorities. These are, however, all based on subjective impressions, and vary from roughly 4 maunds (= 329 lbs.) to over 6 maunds (= 494 lbs.) per person per year. Sir F. A. Sachse, I.C.S., estimated the consumption at an average rate of 9 maunds of paddy which is equivalent to 6 maunds (= 494 lbs.) of rice per head per year in Appendix IX, Vol. II of the *Report of the Bengal Land Revenue Commission* (Government of Bengal, 1940). As already mentioned in a footnote, the minimum requirement according to Dr. Aykroyd is one pound per head per day or 365 lbs. per year.

7. Adopting 344 lbs. (which is the official estimate of consumption of rice per person per year) it is easy to work out the total requirement from year to year. Subtracting 3.76 lakhs of tons (the estimated seed requirement for Bengal as given on page 534 of the *Report on the Marketing of Rice in India*) from the outturn figures shown in column (3) of Table 1 we would get the total supply *exclusive* of net import or export. The surplus or deficit (exclusive of net import or export) fluctuates widely. The gross surplus sometimes exceeded 16 lakhs of tons, and the gross deficit was on two occasions greater than 30 lakhs of tons. Unfortunately for lack of relevant data (except for the seven years for which figures are given in Table 2) we do not know how far these were balanced by export or import.

TABLE 2.
Import and Export of Rice.

Year.	Total import	Total export	Net import	Outturn of rice in lakhs of tons.	Percentage net import = $\frac{100 \times (4)}{5}$	Net surplus or deficit.	Average price.
	in lakhs of tons (sea and river-borne).						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1933-34 ..	5.48*	6.16	-0.68	86.80	-0.78	+ 0.72	2.6
1934-35 ..	9.78	6.02	+3.76	82.73	+4.55	- 0.50	3.0
1935-36 ..	4.32	3.23	+1.09	72.08	+1.51	-15.42	3.3
1936-37 ..	5.74	4.58	+1.16	106.68	+1.09	+17.67	3.5
1937-38 ..	2.45	4.71	-2.26	90.34	-2.50	- 3.69	3.6
1938-39 ..	4.45	4.12	+0.33	75.67	+0.43	-17.37	3.6
1939-40 ..	8.06	4.24	+3.82	84.55	+4.52	- 6.60	4.3
Average (7 yrs.)	5.75	4.72	+1.03	85.55	+1.21	- 3.60	3.4

8. If we confine our attention to Table 2 even then we find that the net deficit was 15.42 lakhs of tons in 1935-36 and 17.37 lakhs of tons in 1938-39, and the surplus was so large as 17.67 lakhs of tons in 1936-37. The net import figures²⁰ were almost negligibly small in comparison, and average prices were also fairly steady, and were not apparently affected by the estimated surplus or deficit. We also know that wheat and/or other cereals do not act as balancing commodities in view of the fact that the total available supply has always been small (something like 2.3 lakhs of ton for wheat and negligibly small quantities of other cereals), and has remained more or less steady. (This, of course, is just what is to be expected as we know that wheat is consumed only by a very small fraction of the population living in urban areas.) Official production figures thus fluctuate widely and do not apparently produce any appreciable influence on prices or on the quantity of import of either rice or wheat or other cereals. This shows that official production figures for rice in Bengal are entirely untrustworthy.

9. I may mention here that in the pamphlet on the *Supply of Rice in Bengal* Mr. N. C. Chakravarti made a detailed comparison between the official estimates and the acreage figures as given in Settlement records which are generally accepted as quite reliable. I am giving the results of the comparison made by Mr. Chakravarti in Table 3 in a summary form. The area under paddy in lakhs of acres according to Settlement records are shown for the three types of rice—Aman (winter), Aus (autumn) and Boro (summer)—separately in column (2); corresponding official estimates for periods nearest to Settlement operations

²⁰ I should mention here that certain figures relating to what is called 'across the frontier (overland)' were given in the *Report of the Bengal Paddy and Rice Enquiry Committee, 1940* (Vol. 1, pp. 17-18) which I am omitting as these are negligibly small (less than a few hundred tons) and also because nothing has been mentioned about the source of the data.

are given in column (3); and the ratio of Settlement and official estimates is shown in a percentage form in column (5). It will be noticed that the Settlement figures were about 20% in excess of official estimates. This shows that official figures are usually underestimated.

TABLE 3.

Comparison of Settlement Records and Official Estimates of Area under Paddy in Bengal.

Type of paddy.	Settlement records.	Official estimates.	Difference.	Percentage difference.
(1)	(2)	(3)	(4)	(5)
Aman (winter)	192.2	144.6	47.6	24.8
Aus (autumn)	59.7	49.2	10.5	17.6
Boro (summer)	3.8	3.9	0.1	2.6
TOTAL	255.7	197.7	58.0	22.7

10. *Methods used for preparing official estimates of area and outturn.*—Mr. H. P. V. Townend has given a most valuable and critical account of the methods used for preparing official estimates of paddy acreage and outturn in the Memorandum submitted by him to the Bengal Paddy and Rice Enquiry Committee and published in Vol. II of the Report (Government of Bengal, 1940). He stated:—

‘To the best of my belief there is no one who considers the present estimates of the annual outturn of aman paddy to be satisfactory; and the method of preparing them must therefore be condemned. In 1918 and 1919 when I was Director of Civil Supplies and it was essential to know what was the yield of paddy in Bengal, in order that Government might decide how much should be allowed to go out of the province, I found all calculations based on the crop forecasts to be defective; and it may be added the general public obviously share the official view that the crop statistics in general are of little value as it is, the general public are so accustomed to disbelieve the forecasts that there is a tendency for them to disbelieve, without examination, any official estimates whatsoever as to the yield of aman paddy.’ (Pages 14-15.)

11. *Prices in 1943.*—I am giving below in Table 4 the monthly average wholesale price of rice (not in husk) in Calcutta based on weekly figures given in the *Indian Trade Journal*.

TABLE 4.

Average Wholesale Price of Rice in Calcutta in rupees per maund ('Indian Trade Journal').

	Rs.	A.	P.		Rs.	A.	P.
January 1943	14	8	0	June	31	14	0
February	14	13	0	July	32	6	0
March	20	14	0	August	35	0	0
April	22	14	0	September	35	0	0
May	29	12	0				

The retail (and black market) prices were, of course, appreciably higher, and varied widely from day to day and even from place to place in the city.