

FOODGRAIN PRODUCTION AND CONSUMPTION—TARGETS, ACHIEVEMENTS AND DATA NEEDS

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I feel greatly honoured to have been invited by the Indian Society of Agricultural Statistics to be the Sessional President for its 42nd Annual Conference. I have been closely associated with the Society almost from its inception, though for the last ten years, when I was outside the country, the association has been less direct. I am very much impressed by the progress made by the Society under the guidance of Dr. P. V. Sukhatme, its Executive President, and Dr. Prem Narain, the Secretary. I am very happy indeed to note the contribution made by the Society to the furtherance of its objectives through the publication of the journal, holding of symposia, training and other allied activities, and I offer my very sincere congratulations to all the persons responsible. The Journal is maintaining its high standards despite the financial constraints and escalating costs.

I do not remember why we called this a Technical Address. I feel I am not competent to give a Technical address in the field of Statistics. What I propose to do is to share with you some of my thoughts and concerns on foodgrain production and consumption — targets and achievements in India. I will also indicate some of the gaps in the data and the

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types of data analyses needed for agricultural planning and policy formulation.

I Foodgrain Production and Consumption : Targets and Achievements

The pivotal role of agriculture in the Indian economy and the importance of foodgrains—both from production and consumption points of view—need no over emphasis. Nor does the success achieved in foodgrains production require reiteration. India turned from being a significant importer of foodgrains during the first two decades after Independence to a country which achieved relative self-sufficiency in the last decade. This so called self-sufficiency has by no means meant that the majority of the population enjoys an adequate diet. In fact, large number of people have been categorised as under-and mal-nourished. And as one reviews the performance during the last three years or looks at the future, say up to 2000 A.D., significant questions emerge. How much food do we need and can we meet our requirements from domestic production?

Confining the attention to foodgrains, the target of production under the Seventh Five Year Plan is 178 to 183 million tonnes subsequently reduced to 175 million tonnes at the time of the mid-term appraisal, to be achieved by 1989-90. This is compared to a base-level production of 154 million tonnes assumed for 1984-85. However according to the Annual Report of the Ministry of Agriculture for 1987-88, the first three years of the Plan are drought years. The foodgrain production in 1987-88, the third year of the Plan is expected to be 7 to 10 per cent lower than the already low production of 1986-87 of 144 million tonnes.

For the Sixth Five Year Plan, which ended in 1984-85, the foodgrains production target was 154 million tonnes; but the actual production was only 145.5 million tonnes, showing a shortfall of 8.5 million tonnes. Yet, in 1985, the country exported 350 thousand tonnes of cereals (net); and the year-end government stocks increased by 2.7 million tonnes over the corresponding period of 1984. Does this mean that the country did not require 154 million tonnes of foodgrains? More over the per capita availability of foodgrains was 166 kilograms in 1985 compared to 175 kg in 1984 and 174 kg in 1986.^a Against this is the fact that there was no

^aIn the absence of data on per capita consumption, per capita availability is used as a proxy and is estimated as net production plus net imports plus change in stocks divided by the population. Net production is derived as 87.5 per cent of gross production of foodgrains, 12.5 per cent representing the allowance for seed, feed and wastage. Data on stocks relate to government stocks only, as those held by traders, producers etc. are not available. Output of the agricultural year July-June is presumed to be available for consumption during the calendar year January to December.

significant increase in real prices of food in 1985. The index number of wholesale prices of foodgrains relative to that of all commodities in 1985 was 81.9 compared to 82.4 in 1984 and 80.4 in 1986 (base 1970-71 = 100). This goes to show that even with a shortfall of 8.5 million tonnes, the food situation could be managed well.

Methods of Target Fixation

These discrepancies are by no means a recent phenomenon; in the past also we had similar experiences, and it is instructive to examine these in some detail. But before doing so let me say a few words regarding the methods of fixation of foodgrain production targets under the five year plans adopted in India. These are often determined in relation to the domestic demand and the plan objectives of self-sufficiency and assumptions regarding trade. Domestic requirements for human consumption are estimated either on the basis of normative assumptions of certain specified levels of nutritional standards of the projected population; or as the economic demand which takes into account base year per capita consumption, planned increases in per capita income, income elasticity of demand and projected population. Demand projections ordinarily assume constant relative prices. Sometimes refinements in demand estimation are introduced taking into account differences in rural and urban per capita consumption levels and income elasticities; and also expected changes in income distribution. A third method is to simply project past trends in per capita consumption. To the human consumption needs thus obtained are added the projected requirements for seed, feed, and industrial uses and allowance for wastage.

The objective of self-sufficiency itself implies that marketed surplus of foodgrains of producers should at least equal market demand at reasonable prices. However, where government undertakes responsibility for supply of foodgrains through the public distribution system, self-sufficiency would mean that the requirements for distribution should be met from domestic procurement and carry over stocks.

Production targets are generally worked out in terms of additional production potential created by the various planned inputs e.g. high yielding varieties, fertilizers, irrigation and increased area under the crops, using the physical quantities and response coefficients. An alternative way is to project the area and yield per hectare of each foodgrain under irrigated and unirrigated conditions separately extrapolating past trends, and obtain the projected output as a summation of the relevant products.

The actual production achieved in a year, however, depends upon the weather, the realised levels of inputs and responses, occurrence of pests

and diseases, if any, and economic factors such as levels of prices and so forth which influence farmers' decisions regarding the area under the crop and level of technology adoption. The actual per capita consumption in a year depends upon the level of production achieved against the target including the effect of weather, imports and changes in stocks. Where the shortfall in production is not made up from imports, adjustments between supply and demand take place through variations in prices. In India, where an extensive public distribution system exists, the supply-demand equation operates in such a way that quantities distributed generally equal procurement plus net imports and changes in stocks. Where administered prices and open market prices coexist, the supply-demand imbalances are reflected more in open market prices. Also the actual per capita consumption may differ from the planned level because of differences between projected and actual population, failure to achieve planned levels of income growth and shortfalls in the achievement of production targets.

After this rather long digression regarding the mechanics of fixation of production and consumption targets and factors influencing the actual achievements, let me now review the past experience.

Targets and Achievements in the Five Year Plans

Government's direct intervention and assistance to agricultural development and increasing foodgrains production in particular started with the initiation of the Grow More Food Campaign in 1942.³ No targets of foodgrains production were fixed in the first phase of the campaign covering 1942-43 to 1946-47. It is only in the second phase that a target of additional production of 4 million tons⁴ was fixed for the five year period beginning with 1947-48. This figure was perhaps based on average imports around that period; and did not specifically take into account the needs of increased population. Towards the close of 1948, the objective of self-sufficiency to be achieved by March 1952 was announced and the deficit to be made up by the target date was set at an additional production of 4.8 million tons over the production in 1947-48. The actual production of cereals and gram in 1951-52 was about 2 million tons less than that in 1947-48⁵.

³Earlier efforts were largely by way of construction of irrigation projects which helped to increase agricultural production on area basis. Indirect efforts related to institutional reforms.

⁴Tons refer to long tons of 2240 pounds; no attempt has been made to convert these into metric tons, as the targets were fixed in round numbers.

⁵Bulletin on Food Statistics Jan 1955. The Bulletin gave data for cereals and gram only.

Under the First Five Year Plan, the target of foodgrains production at the end of the Plan was fixed in terms of assuring to the population the same per capita level of consumption as was available from domestic production and imports in the base year. This approach thus did not allow for any income effect on per capita consumption. The target for 1955-56 the last year of the plan was to achieve an additional production of 7.6 million tons over the base level production of 54 million tons in 1949-50. The actual production in 1955-56 at 65.8 million tons was higher than the target.⁶

However, because the procurement during the year was very small the country had to import 1.4 million tons of foodgrains in 1956 to meet domestic requirements. The total quantity of foodgrains distributed during the year was about 2 million tons; and government stocks were drawn down to the extent of 0.6 million tons. Further more the population in 1956 was 397 millions, 13 millions more than 384 millions projected in the First Plan, with the result that the actual per capita availability in 1956 was only marginally higher than that in 1950.

The income-elasticity approach for estimating the demand was introduced for the first time in the Second Five Year Plan and a level of 18.3 ounces of consumption of foodgrains per day per adult was proposed for 1961, the last year of the plan; the base year consumption was 17.2 ounces per adult.⁷ This translated into a production target initially fixed at 75 million tons to be achieved by 1960-61 compared to the assumed base level of 65 million tons in 1955-56. This target was subsequently raised to 80.5 million tons. In retrospect, the actual production in 1960-61 was slightly higher than the revised target. But even then, the country had to import 3.4 million tons of foodgrains in 1961 largely to meet public distribution requirements. About 4 million tons were supplied during the year including 0.5 million tons of domestic procurement. Once again the population according to the 1961 census was about 438 millions about 30 millions higher than the number projected in the plan. The actual per capita availability of foodgrains worked out to 19.1 ounces, an annual increase of 0.9 per cent over the plan period. The per capita income rose by 1.9 per cent a year in the second plan, based on revised estimates.⁸

Under the Third Plan, a target of 100 million tons of foodgrains was fixed for 1965-66 on the basis of normative levels of per capita consumption necessary to meet the calorie requirements. It was noted that this

⁶Both the target and actual production relate to unadjusted figures. The adjusted estimate of foodgrains production for 1955-56 was 68.3 million tons.

⁷Adult equivalents = $0.86 \times$ population.

⁸These figures are consistent with an income elasticity of demand close to 0.5.

would also be in accordance with the income elasticity approach, assuming a 3.2 per cent per capita income growth, and an income elasticity of 0.5 for all foodgrains taken together at the all-India level. In the event, 1965-66 was a disastrous drought year. The actual production was lower than the target by 29 per cent. Compared to 1964-65 the output dropped by 19 per cent, one of the largest declines recorded. The country had to import 10.2 million tons of cereals in 1966 to maintain a public distribution of 14 million tons to which domestic procurement contributed 4 million tons. The per capita availability during the year was about 149 kgs. compared to 171.1 kg in 1961 or about 13 per cent lower than the base level. Real prices rose by 17 per cent in 1966 compared to 1961 levels.⁹

The Fourth Plan covering the period 1969-70 to 1973-74, aimed at a target of 129 million tonnes of foodgrains in 1973-74, compared to base level output of 98 million tonnes in 1968-69.¹⁰ The actual production recorded in 1973-74 was only 104.7 million tonnes, about 19 per cent short of the target. Yet together with imports of 5.2 million tonnes, the available foodgrains of 110 million tons (gross) were adequate to meet the food needs in 1974. A total quantity of 5.7 million tonnes was procured during the year which enabled a public distribution of 10.8 million tonnes. However the actual population in 1974 was lower than the projected figure by about 10 millions. In per capita terms, the net availability rose only marginally from 162.5 kgs in 1969 to 164.7 kgs in 1974. The increase in per capita income during the Fourth Plan was of the order of 1.1 per cent a year. Real prices remained more or less at the same level in both years. Obviously, in retrospect 129 million tonnes was too high a target from the point of view of requirements.

Under the draft Fifth Five Year Plan, originally a target of 140 million tonnes of foodgrains was proposed, but this was drastically reduced to 125 million tonnes to be achieved by 1978-79. This figure was even lower than the 129 million tonnes target fixed for 1973-74 under the Fourth Plan. The actual production in 1978-79 was, however, 131.4 million tonnes, 6.4 million tonnes higher than the target. In 1979, public distribution amounted to 11.7 million tonnes which was 2.2 million tonnes lower than the quantities procured (13.9 million tonnes—a new record). Stocks with government increased (0.36 million tonnes) and there were

⁹Index of real prices of foodgrains

$$= \frac{\text{Index Number of Wholesale prices of foodgrains}}{\text{Index Number of Wholesale prices of all commodities}} \times 100$$

¹⁰For the years 1966-67 to 1968-69, annual plans were prepared and the draft fourth five year plan covering 1966-67 to 1970-71 was scrapped.

net exports of 0.32 million tonnes during the year. By this year, the food situation in the country was comfortable and the per capita availability improved to 173.9 kg in 1979 an increase of 1.1 per cent a year during the plan period. Per capita national income rose by 2.9 per cent a year and real prices declined. Perhaps the 125 million tonnes target was inadequate.

Attention has already been drawn to the shortfall between the actual output and the target under the Sixth Plan. In 1985, despite the poor production performance compared to the previous year, another record quantity of about 20 million tonnes was procured whereas the actual public distribution was 15.8 million tonnes during the year. In the absence of data on private stocks, it is difficult to understand how the supply demand balance operated during the year.

Plan-wise information on targets and achievements of foodgrains production and population, procurement, imports (net), stock changes and public distribution of foodgrains are given in Tables 1 and 2.

TABLE 1—TARGETS AND ACHIEVEMENTS OF FOODGRAINS PRODUCTION UNDER SUCCESSIVE FIVE YEAR PLANS

Plan	Unit	Base Year	Base Level of output (millions)	Last Year of plan	Level of output	
					Target (millions)	Achievement (millions)
First Plan	tons	1949/50	54.0	1955/56	61.6	65.8@
Second Plan	tons	1955/56	65.0	1960/61	80.5	80.7@
Third Plan	tons	1960/61	76.0	1965/66	100.0	70.9
Fourth Plan	tonnes	1968/69	98.0	1973/74	129.0	104.7
Fifth Plan	tonnes	1973/74	104.7	1978/79	125.0	131.9
Sixth Plan	tonnes	1979/80	128.0	1984/85	154.0	145.5
Seventh Plan	tonnes	1984/85	150.0	1989/90	178.0 to 183.0 Subsequently revised to 175.0	N.A.

Note : 1 ton = 2240 lbs. 1 ton = 1.016 tonnes 1 tonne = 1000 kg.

@unadjusted estimates

SOURCES : Directorate of Economics and Statistics, Indian Agriculture in Brief, Various Editions, Planning Commission : Five year Plan Reports.

TABLE 2—POPULATION, PROCUREMENT, IMPORTS, STOCK CHANGES AND PUBLIC DISTRIBUTION OF FOODGRAINS

Year	Mid Year Population (millions)	Domestic Procurement (million tonnes)	Net Imports (million tonnes)	Changes in Stocks (million tonnes)	Distri- bution (million tonnes)
1950	357.5	4.6	2.1	-0.9	7.6
1951	363.3	3.8	4.8	+0.6	8.0
1956	397.5	@	1.4	-0.6	2.1
1961	442.7	0.5	3.5	-0.2	4.0
1966	493.2	4.0	10.3	+0.1	14.1
1969	537.2	6.4	3.8	+0.5	9.4
1974	590.0	5.7	5.2	-0.4	10.8
1979	660.3	13.9	-0.2	+0.4	11.7
1985	750.9	20.1	-0.3	+2.7	15.8

@Less than 50,000 tonnes

SOURCES : Directorate of Economics and Statistics, Bulletin on Food Statistics, various issues, Ministry of Finance : Economic Survey, various issues.

The preceding review of progress of production and consumption of foodgrains in relation to targets, plan by plan has shown that the production targets for the final years of the plans were achieved under the First and Second Plans; and despite this achievement, the country had to import foodgrains to meet the gap between domestic procurement and public distribution. Also in these two plans, the actual population in the last year was much higher than that projected. The output in the final year of the Third Plan was affected by a disastrous drought that necessitated more than 10 million tonnes of imports and there was a steep rise in real prices. In the Fourth Plan, production again fell short of the target, but imports were 5.2 million tonnes, the balance of requirements being met from domestic procurement. Also, the increase in population was slightly less than that anticipated. By the middle of the Fifth Plan, the food situation eased, imports were eliminated and the modest food production target was exceeded in the final year of the Plan. Under the Sixth Plan, the entire public distribution requirements in the last year were met from domestic procurement, although there was a 8.5 million tonnes shortfall in foodgrain production compared to the target. Thus the quantum of imports mainly depended upon the requirements for maintaining public distribution system and supplemented domestic procurement.

In the year when procurement operations were done to support prices, the excess over public distribution went to build up stocks.¹¹ The existence of large buffer stock facilitated the management of the food situation during the last decade. At the same time, availability of stocks does not necessarily mean increase in per capita consumption. Unless per capita incomes, particularly of vulnerable sections of population increase, their food consumption may not increase.

A comparison of the actual output in the last year of the plan with the target is not strictly valid. The targetted level of production assumes normal weather whereas the actual production is influenced by the amount of rainfall and other climatic conditions.¹² While some attempts have recently been made to develop a rainfall index and assess separately the effect of rainfall on crop production, these are far from perfect. Since output targets are determined in terms of production potential created by various input programmes it is worthwhile reviewing the progress of these programmes. Table 3 gives the targets and achievements of agri-

TABLE 3—TARGETS AND ACHIEVEMENTS OF AGRICULTURAL PROGRAMMES—SUCCESSIVE FIVE YEAR PLANS

Plan/Last Year	Actual Area under foodgrains (million ha)	Additional irrigated Area		Area under High Yielding Varieties ^d		Fertilizer (NPK) Level reached	
		Target	Achievement (million ha)	Target	Achievement (million ha)	Target	Achievement (million tonnes)
First Plan 1955-56	110.6	7.9	5.1 ^b	—	—	0.12 ^a	0.11 ^a
Second Plan 1960-61	115.6	7.8	5.8 ^b	—	—	0.51 ^a	0.21 ^a
Third Plan 1965-66	115.1	10.4	7.5 ^b	—	—	1.63	0.79
Fourth Plan 1973-74	126.5	12.0	7.1 ^c	25.0	26.0	5.50	2.84
Fifth Plan 1978-79	129.0	11.0	8.5 ^c	40.0	40.1	5.00	5.12
Sixth Plan 1984-85	126.7	13.6	7.9 ^c	56.0	54.1	9.65	8.21
Seventh Plan 1989-90	—	10.9	—	70.0	—	13.5 to 14.0	—

^aRelates to Nitrogen only

^bBased on Progress Reports

^cBased on Utilization

^dCumulative Total

SOURCES : Directorate of Economics and Statistics, Indian Agriculture in Brief, Various Issues, Planning Commission Five year Plan Reports, Ministry of Finance, Economic Survey, Various Issues.

¹¹Taking an average of three years 1984 to 1986, procurement was about 15 per cent of net production and public distribution, about 12 per cent of net availability.

¹²To avoid this problem, the plan target of output is given in terms of a range as in the Seventh Plan.

cultural programmes under the successive five year plans. The actual area under foodgrains in the final year of each of the plans is also given.

Review of Agricultural Programmes and Production Potential Created by them

It is evident that, generally, the achievements in respect of irrigation, both major and minor fell considerably short of the targets in each of the five year plans. Further the data on achievements in the first three plans are based on progress reports in respect of major and minor irrigation schemes while those for the subsequent plans represent the difference between the estimated utilization in the final year of the plan and that in the base year. There is a large unexplained discrepancy between the additional area benefitted by irrigation schemes as reported in the progress reports and the additional gross irrigated areas as reported in the Land Utilization Statistics, which requires further investigation.¹⁸ The shortfall in respect of coverage of area under high yielding varieties (H.Y.V.) was relatively small in the Sixth Plan while under the Fourth and Fifth plans, actual achievements exceeded the targets. Fertilizer consumption fell short of the targets in each of the plans except the Fifth Plan.

The cumulative effect of these shortfalls and achievements can be assessed in terms of production potential. To minimize the effect of weather on any single year's output, three year averages are considered and I quote the results from a forthcoming IFPRI study bringing it upto date to cover the three years 1984-85 to 1986-87. The relevant data for the triennia ending 1961-62, 1971-72, 1983-84 and 1986-87 are given in Table 4. The expected production based on the potential created and the actual output in the period 1969-70 to 1971-72 differed by about 2 million tonnes. For the triennium ending 1983-84 the difference between the potential and actual production is large (8 million tonnes) if the response coefficient for fertilizers (NPK) is taken as 1 : 10. If the alternative and more modest response coefficient of 1 : 7 is taken for fertilizers, the difference reduces to about 1 million tonnes. For the last period, even with the lower response coefficient, the difference between the potential and actual increases to 5 million tonnes. Three possibilities can explain

¹⁸. For a statement of the problem, see "Irrigation Statistics" Appendix 2 in J. S. Sarma and Shyamal Roy in *Two Analyses of Indian Foodgrains Production and Consumption Data*, International Food Policy Research Institute, Washington D.C. Research Report 12, November 1979.

TABLE 4—EXPECTED PRODUCTION USING RESPONSE COEFFICIENTS
A. EXPECTED INCREASE IN PRODUCTION POTENTIAL (in millions)

Inputs	Assumed Response Coefficient	Use Levels-3 year Averages				Expected increment in production (tonnes)		
		1959 60 to 1961 62	1969 70 to 1971 72	1981 82 to 1983 84	1984 85 to 1986 87	1969 72 over 1959 62	1981 84 over 1969 72	1984 87 over 1981 84
Area (ha)	0.45/ha	115.79	123.60	128.46	126.96	3.47	2.23	-0.75
Irrigation (ha)	0.50/ha	22.10	29.90	38.69	46.70	3.90	4.40	4.00
Shift to wheat and Rice (ha)	0.33/ha	47.56	55.68	63.37	64.15	2.68	2.54	0.26
Fertilizer (tonnes)	(i) 10.00/tonne (ii) 7.00/tonne	0.15	1.29	5.00	6.42	11.47	37.04 25.93	14.20 9.94
					Total	21.52	46.21	17.71
					Total		35.09	13.45

B. ACTUAL INCREASE IN PRODUCTION

	Actual Production (million tonnes)	Addl. Production over the previous period (million tonnes)
1959/60 to 1961/62	80.62	—
1969/70 to 1971/72	104.36	23.74
1981/82 to 1983/84	138.40	34.04
1984/85 to 1986/87	146.68	8.28

SOURCE: J.S. Sarma and Vasant Gandhi 'From Significant Imports to relative Self-Sufficiency: A Study of Foodgrain Production and Consumption in India, with projections to the year 2000. IFPRI, Washington D.C. (Draft)

the difference : first, the response coefficient for fertilizer may have gone down further taking into consideration that fertilizer use is being extended to rainfed areas and to coarse grains; secondly, the adverse effect of droughts in 1985-86 and 1986-87 on crop production are abnormally large; and thirdly production estimates for 1985-86 and 1986-87 are under estimated. In fact by using a response coefficient of 1 : 5 the difference gets reduced to about 2 million tonnes; but this is unlikely; for, at this level of response, fertilizer use may not be remunerative. But which of these explanations is valid, I confess, I do not know.

Trends in Per Capita Availability

Also the data relating to targets and actual production utilized for reviewing the achievements under the first three plans refer to unadjusted figures as published by the Directorate of Economics and Statistics. In the early period from 1949-50 to 1964-65 the published figures over time were not strictly comparable due to extension of reporting area and changes in method of yield estimation. However in working out the per capita availability, adjusted estimates of production have been utilized for the earlier period. These are given in Table 5 for the period 1950 to 1986. They show wide annual fluctuations which are partly due to weather and partly due to changes in private stocks which are not taken into account in their estimation¹⁴. A three year moving average smoothens out part of the fluctuations and the average per capita availability then moves within a narrow band of 150 to 170 kg. The trend growth over the entire period is only 0.2 percent a year. During this period, the foodgrains production increased at 2.6 per cent a year. While population increased at 2.2 per cent. The rest of increased production was used to reduce imports and build up stocks.¹⁵

Further, as pointed out earlier, the net availability of foodgrains is computed by making an uniform allowance of 12.5 percent for seed, feed, other uses and allowance for wastage. Feed use itself is subject to annual variations depending on the size of the crop apart from long-term changes in the allowances for these separate factors. I would refer to this question later.

The inconsistencies in production figures translate into trends in per capita net availability which in turn are not consistent with income and

¹⁴. The IFPRI study by J. S. Sarma and Shyamal Roy estimated that during the period 1975-77 the decline in stocks with traders and producers might be around 2 million tonnes per year.

¹⁵. Details of this analysis are reported in a forthcoming publication from IFPRI by J. S. Sarma and Vasant Gandhi—referred to later.

TABLE 5—PERCAPITA AVAILABILITY OF FOODGRAINS IN INDIA 1950-1986

<i>Year</i>	<i>Kilograms/Year</i>	<i>Year</i>	<i>Kilograms/Year</i>
1950	157.4	1968	168.4
1951	144.1	1969	162.5
1952	140.7	1970	166.1
1953	150.6	1971	171.1
1954	167.1	1972	170.6
1955	162.0	1973	153.9
1956	157.6	1974	164.7
1957	163.2	1975	148.0
1958	149.2	1976	164.6
1959	170.9	1977	156.8
1960	164.6	1978	170.8
1961	171.1	1979	173.9
1962	168.2	1980	150.2
1963	162.0	1981	165.6
1964	165.4	1982	165.7
1965	175.3	1983	159.3
1966	149.0	1984	174.5@
1967	146.5	1985	165.6@
		1986	173.8@

@Provisional

SOURCES : Bulletin on Food Statistics, Directorate of Economics and Statistics—
Various issues.

price movements. The consistency of the changes in estimates of per capita national income, per capita availability and in real prices is examined in Table 6, once again using three year averages. This comparison shows that 1.6 per cent fall in per capita availability between 1970-72 and 1982-84 is not consistent with nearly 18 per cent rise in per capita income and 15.5 per cent fall in real prices. Even taking the per capita availability during 1984-86, the 1.2 per cent rise in consumption compared to 1970-72 is not consistent with 25 per cent increase in per capita

income and 19 percent fall in real prices, over the same period. This indicates the possibility that the production estimates in 1982-84 and 1984-86 are under estimated, relative to 1970-72. Other sources of error may be in seed, feed, and wastage ratio and changes in private stocks, or changes in income and price elasticity coefficients, though these may not explain the discrepancy fully. It is important that such analyses should be undertaken periodically with more firm data than what I could hastily put together.

TABLE 6—ESTIMATES OF PER CAPITA AVAILABILITY OF FOODGRAINS
PER CAPITA NATIONAL INCOME AND INDEX
NUMBERS OF REAL PRICES

Item	1970-72 Average	1982-84 Average	Variation in Col (3) over(2)	1984-86 Average	Variation in Col (5) over(2)
(1)	(2)	(3)	(4)	(5)	(6)
Per Capita Availability of foodgrains Kg/Year	169.3	166.6	-1.6%	171.3	+1.2%
Per Capita National Income Rs/Year	624.0	734.0	+17.6%	778.3	24.8%
Index Number of Real Prices of foodgrains 1970-71 = 100	100.3	84.8	-15.5%	81.6	-18.6%
Index Number of Real Prices of Foodgrains =	$\frac{\text{Index Numbers of Wholesale Prices of foodgrains}}{\text{Index Numbers of Wholesale Prices of all commodities}} \times 100$				

SOURCE : Derived from data taken from the Bulletin on Food Statistics-Directorate of Economics and Statistics.

Production and Consumption Projections for 2000

These discrepancies have serious implications, particularly when one looks at the future. The International Food Policy Research Institute recently analysed the past trends in foodgrain production and consumption in India and made an attempt to project supply-demand balances

by the end of the century under alternative scenarios as part of its global, regional and national food gap analyses¹⁶. The results from this study indicate that if the past trends in per capita income in rural and urban areas continue into the future, the projected demand for foodgrains in 2000 is estimated to be 163 million tonnes for a projected population of 976 million. The estimated allowances for seed, feed, other uses and waste add up to about 38 million tonnes making a total demand of 201 million tonnes. Two other scenarios attempted in the study allow for a 5 percent a year income growth assumed in the Seventh Five Year Plan under the Perspective Plan for Economic Development and another, a growth rate of 5.3 per cent a year which provides for accelerated rural per capita income growth at the same level as that of urban incomes. The two latter scenarios gave estimates of demand of 216 million tonnes and 224 million tonnes respectively including enhanced derived demand for feed for increased livestock production to meet the demand resulting from faster income, growth. All these estimates do not make any allowance for change in income distribution.

In a further exercise, specific assumptions were made regarding redistribution of income under which the quartile shares of rural and urban incomes would change to 15, 20, 25 and 40 per cent from the existing shares of 12, 18, 25 and 45 percent for rural areas, and 11, 17, 24 and 48 per cent for urban areas for quartiles 1 to 4 in each case. These assumptions would add 6 to 8 million tonnes to the aggregate demand in 2000. The details are given in Table 7.

The method adopted for the supply projections assumed, generally, continuation of past trends in area and yield per hectare for each of the principal grains, namely rice, wheat, coarse grains and pulses to 2000. Projected area under each crop in 2000 was proportionately adjusted to conform to the control total of foodgrains area which is independently projected. These projections were done for each of the six regions into which the country was divided. Two alternative projections were also attempted: one at the level of all foodgrains in each region and the other for total foodgrains at the all-India level. These alternative projections gave a range of output—211 to 219 million tonnes in 2000 (Table 8). Even to achieve these levels of production, productivity growth needs to be maintained at 2.3 to 2.5 percent a year which in turn requires a first rate agricultural research system and adequate support from input supplies, extension and infrastructure development. In particular, these

¹⁶. J. S. Sarma and Vasant Gandhi (1987) Effects of Income Growth and Distribution Changes on the Demand for Foodgrains in India—Seminar Brief—International Food Policy Research Institute—Washington DC.

TABLE 7—PROJECTED TOTAL DEMAND FOR FOODGRAINS
IN INDIA, 2000

(million tonnes)

Alternative Income Growth	Sector	No change in Income Distribution@		With change in Income Distribution	
		Human Demand	Total Demand	Human Demand	Total Demand
		Continuation of past per capita income growth rates	Rural	117.33	
	Urban	45.99		48.73	
	Total	163.33	200.75	171.01	208.43
Growth rates envisaged in the perspective plan	Rural	124.41		129.09	
	Urban	47.27		48.83	
	Total	171.69	215.70	177.93	221.94
Accelerated growth rate	Rural	131.14		135.23	
	Urban	47.27		48.83	
	Total	178.41	224.36	184.06	230.01

Notes : 1. Total demand includes allowance for seed, feed, other uses and wastage.

2. Parts may not add up to total due to rounding.

@Under this assumption the Income shares are :

Sector	Quartiles			
	1	2	3	4
Rural	12	18	25	45
Urban	11	17	24	48
	†Under this assumption the income shares are :			
Rural	15	20	25	40
Urban	15	20	25	40

SOURCES : J.S. Sarma and Vasant Gandhi—Effects of Income Growth and Distribution Changes on the Demand for foodgrains in India—Seminar Brief International Food Policy Research Institute Washington D.C.

levels of output envisage a gross irrigated area of 100 million hectares, of which about 60 percent will be under foodgrains, 20 million tonnes of fertilizers (NPK) of which 70 per cent will be applied to foodgrains at the end of the century. Arrangements are also needed for maintaining adequate quantities of improved seeds of high yielding and other varieties. This also calls for setting of reasonable and realistic targets based on accurate data.

TABLE 8—ALTERNATIVE PROJECTIONS OF PRODUCTION OF FOODGRAINS

<i>Alternative</i>	<i>Projected Production Million Tonnes</i>
1. Based on each Crop projected separately in each region	219.4
2. Based on Foodgrains projected separately in each region	210.7
3. Based on total Foodgrains projected at the All India Level	215.2

SOURCE : J. S. Sarma and Vasant Gandhi : From Significant Imports to Relative Self Sufficiency : A Study of Foodgrain Production and Consumption in India, International Food Policy Research Institute, Washington D.C. (Forthcoming).

The above analysis shows that effective implementation of an agricultural strategy leading to acceleration of growth rates and improvement of income distribution can make a difference between India's becoming a country marginally surplus in foodgrains or becoming a substantial importer.

II Gaps in Data and the Types of Data Analyses Needed

I have already referred to the practice of deriving the net production of foodgrains from gross production by using an allowance of 12.5 per cent for seed, feed and wastage. This magic figure of 12.5 per cent has remained constant for the last four and a half decades and has not been revised. It is reasonable to expect that with the introduction of high yielding varieties of cereals, seed requirements as a proportion of production must have declined. On the other hand the use of foodgrains as livestock feed may have increased, particularly with rapid expansion in the output of milk and poultry. Wastage and losses must have declined. The combined effect of these pluses and minuses is not known. There is

an urgent need for revising these estimates. Although I am happy to note that some work has been initiated in this direction in some areas of the country, high priority needs to be accorded to extend the coverage of the studies to the entire country.

Let me now draw attention to a few other gaps in the data-data needed for agricultural policy and planning and raise a few pertinent questions.

Among Third World countries, India is known to have a good system of agricultural statistics. Initially, during the 1860s the system was evolved as a by-product of revenue administration. Its scope was extended to cover crop forecasts, designed primarily to serve British Trade interests. During the Second World War, when the Government's attention was focussed on meeting the critical food situation, the need for timely and reliable food statistics was recognised and the objective method of crop-cutting experiments on randomly selected plots for yield estimation was evolved. These developments were largely the result of the efforts of the Statistical Branch of the Indian Council of Agricultural Research under the leadership of Dr. P.V. Sukhatme and the Indian Statistical Institute under Professor P.C. Mahalanobis. More systematic efforts to improve the agricultural statistics were made after Independence in response to the felt needs of the Five Year Plans. Notable contributions to these efforts in the fifties and sixties were made by V.G. Panse, W.R. Natu and S.R. Sen. The seventies were a period of consolidation but it appears from several accounts that in the eighties there has been stagnation, if not actual deterioration in the types of data generally available, their quality and timeliness.

To mention a few of the more glaring lacunae, even in early 1989, the latest year for which land utilization data are published relate to 1982-83, and even here, the data for some states refer to 1980-81 or 1981-82.¹⁷ Further there are large discrepancies between the statistics of irrigated area reported in the Land Utilization Statistics and those based on the progress of irrigation schemes, major, medium, and minor, under the various five year plans to which I referred earlier. Data on gross irrigated area by sources are not available despite the recommendations of various committees. In the field of animal husbandry statistics, time series data on output of meat are not available from national sources, the only complete data available are those published by the Food and Agriculture Organization of the United Nations. I understand, however, that some surveys are currently in hand from which it should be possible to derive the all-India estimates of certain types of meat output.

¹⁷This statement is based on the data contained in the latest issue of Indian Agriculture in Brief (21 St. Edition).

The precise contribution made by the so-called 'minor' but high value crops to the agricultural output is not known. Observers in the field note a substantial rise therein, which, for want of reliable data, cannot be quantified. Data on response coefficients or 'yardsticks' for various inputs computed and widely used earlier need to be revised and brought up-to-date in the light of analysis recently done at the IASRI. Large amounts of data collected under the All-India Comprehensive Scheme of Cost of Cultivation of crops are not analysed, published or freely made available to research workers. Even the NSS data on household consumption, quantities, and expenditure for 1977-78 were available with a considerable time lag, although there has been some improvement in this regard with respect to 1983 household expenditure data. Data on rural industry and services and their contribution to national income also require improvement. I can go on adding to this list; but let me resist the temptation and move on to raise a few questions.

Data Gaps : A few Questions

I am baffled why there has not been much more rapid progress in this field till recently. It is not true that methodologies do not exist. Methods of estimating response coefficients, seed, feed and wastage ratios are known. It is not true that trained personnel are not available. We have an exportable surplus of trained statisticians of proven competence, and there are also unemployed graduates and masters in social sciences who are potential enumerators and analysts. It is not true that funds are a limitation. First, many of the gaps can be filled from secondary sources, or data collected through a marginal expansion of existing surveys and addition of analytical staff. Secondly, the amounts involved in augmenting existing resources are not very large. It is not true that there is no demand for the data. The Bulletin on Food Statistics and the Economic Survey publish year after year data on total and per capita availability of foodgrains using the 12.5 per cent allowance for seed, feed and wastage. It is obvious that conclusions drawn regarding trends in per capita consumption over long periods of time are apt to be misleading.

Where, then does the problem lie? Has this situation arisen because of the insufficient recognition by the policy makers of the need for timely and reliable statistics, or in other words their indifference? Or is it that their advisers some how 'come up' with the figures when the need arises? Do they not realise the cost of conclusions based on incorrect data or is it that the quality of data, does not matter as long as they suit their

conclusions? It is not suggested that all policy conclusions must stop till the quality of data improves. It may be true that some data are better than no data as long as they are used with caution. Also one can start with whatever data one has and go on improving their scope and content. However, it is important to recognise that the subsequent stage of improvement may not arise if one gets 'used' to utilizing the 'available' data without questioning them. It may also be true that the importance of reliable data is appreciated only in times of food crises, only to be forgotten once the situation eases. Or are the gaps too trivial and do not affect policy formulation and implementation in any way?

May be the reasons are more fundamental, having to do something with Central and State organizations dealing with agricultural statistics. The agencies may be too preoccupied with maintenance of routine data so that they have no time for reflection, or for identifying let alone gaps, taking measures for improving them. May be, the glamour of agricultural statistics is no longer there.

Changing Data Needs in a Dynamic Agricultural Sector

Before I conclude, let me draw attention to some of the more important needs of data analyses and special studies. As we continue to make advances in techniques of agricultural planning and policy, the needs of data analyses also multiply. In the Panse Memorial Lecture presented at this Society in February 1980, John Mellor had drawn attention to these changing needs for effective agricultural policy.¹⁸ Some of these merit reiteration. He advocated the analysis of returns to controlled water supplies, interaction of water with technology and role of ground water as an instigator of multiple cropping, greater intensity per crop and increased stability as compared to other sources of supplies. Similarly, the relationship between agricultural growth and infrastructure, particularly roads, electricity and markets, needs to be studied in the different agroclimatic regions. It has been observed for example that as one moves away from roads, electric lines and markets the intensity of farming declines. The development of infrastructure also leads to growth in employment and incomes, and reduction in poverty. As infrastructure takes a long time to develop, such studies are needed urgently. To start with, even descriptive data relating to infrastructure should be obtained on a regional basis and related to agricultural output and productivity.

¹⁸John W. Mellor (1980) "Agriculture in Growth"—Changing Research and Data Needs for Effective Policy"—Dr. V. G. Panse Memorial Lecture, Indian Society of Agricultural Statistics, New Delhi.

Similarly, it is necessary to shed light, in the dynamic context of constantly changing technology, on identifying regions that are lagging in the adoption of technology and the reasons therefore in terms of investment, institutions or physical environment. Other areas where indepth studies are required include the linkages between agricultural growth, employment and income, improvements in the efficiency of agricultural output technological and economic aspects of dry farming, use of agricultural implements, and trends in land and labour productivity. These create immense demands on data and the agricultural statistics system should be in a position to provide these. Basic statistics regarding area, production, and prices of crops are important, but these are not the only ones needed.

Detailed analyses are required at a disaggregated level on the sources of fluctuations in agricultural output, their effect on the incomes of the poor and the methods of mitigating the hardships. On the consumption side, more detailed studies are required on the consumption patterns of different income groups, particularly of food articles other than cereals and pulses. Nutrition studies should have an appropriate poverty alleviation focus.

This list of data, and data analyses and special studies may, at first sight appear to be overwhelming. But with the establishment of agricultural universities and other research institutions the data analysis capability has vastly increased and the arrival on the scene of personal computers greatly augments this capability. Further, many of these studies require multidisciplinary approach and collaboration among agricultural statisticians, agricultural economists and other agricultural scientists. What is needed is a properly coordinated link between policy makers and these relevant institutions. The policy makers should make their requirements known, sponsor the analytical studies and utilize the results. There is some evidence that this process has started in the Planning Commission but it is important that this needs to be followed up at a more decentralised level.

My objective in raising these questions is not to belittle the achievements so far in data improvement, nor to under-rate the difficulties in resolving some of the problems. The intention is to highlight some of the issues and provoke thinking and discussion among this eminent body of agricultural statisticians with the hope that these would lead ultimately to action in the not very distant future.

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