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DEMAND AND SUPPLY
PROJECTIONS FOR
AGRICULTURAL
COMMODITIES**

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Seminar on
DEMAND AND SUPPLY
PROJECTIONS
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COMMODITIES



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AN ESTIMATE OF DEMAND FOR CEREALS AND
PULSES IN THE COMING DECADE

A. S. Patel and V. S. Vyas*

Introduction

Economic growth gives rise to a number of forces leading to a rapid increase in demand for foodgrains. These forces many a time raise difficult problems if the supply is not adequate. Ensuring a balance between the demand for and supply of foodgrains therefore, is one of the important tasks of the Government or the planning authority in a developing economy. However, it is not merely the overall balance between the demand and the supply of foodgrains which is important in the context of a developing economy. Equally important is the balance between the demand for particular foodgrain and its supply.

With the possible break-through in agriculture, it is quite likely that India may become self-sufficient in foodgrains in the near future. It can, however, be maintained that even under such prospective conditions the importance of the study of balancing demand and supply need not be neglected. The task of planning authority in these circumstances becomes more complex because once the scarcity conditions disappear both demand and supply acquire greater sensitivity. In these conditions balancing different aspects of demand and supply rather than overall balance assumes greater significance.

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Factors Determining Demand for Foodgrains

There are varied and complex demographic, economic and social factors determining the demand for foodgrains in a developing economy. The quantification of all these factors is a difficult task. The key factors are growth in population and growth in per capita income. Another complicating factor is urbanization. Urbanization has rather two opposing influences on the demand for foodgrains in any developing economy. On the one hand, the per capita consumption of foodgrains in the urban areas is lower than that in the rural areas and the expenditure (or income) elasticity of demand is also lower. On the other hand usually the pace of urbanization in the developing countries is very rapid, hence the number of people in the cities and towns increases rapidly which in turn necessitates progressively larger supplies of foodgrains in the urban areas. Thus, it will be useful to prepare separate estimates of demand for foodgrains for the rural and urban sectors.

Rural-Urban Population Growth

The task of preparing separate rural-urban population estimates is not easy in the inter-census years. The Foodgrains Enquiry Committee had made such attempt in 1957. The Committee assumed that the growth rate of the urban

1. From the data collected in the National Sample Survey (NSS) 16th round it seems that the per capita consumption of cereals in the urban areas is 81 per cent of that in the rural areas. For a detailed discussion see: Prospects for Self-sufficiency in Food—An Analysis of Demand for and Supply of Foodgrains during 1950-51 to 1975-76, unpublished Ph.D. thesis prepared in the Department of Economics of Sardar Patel University, Vallabh Vidyanagar, 1969.

population will be 2.4 times the growth rate of the total population. The population census figure of the last decade showed this to be an over-estimation. The rate of growth of the total population was 2 per cent per year in 1951-61 period; 1.7 per cent for the rural areas and 3.2 per cent for the urban areas. The rate of growth of urban population can be taken as 4 per cent per year for 1961-71 while for 1971-81 it is assumed to grow at the rate of 4.5 per cent. Higher growth rate for the latter is assumed on the ground that urbanization will proceed at a more rapid rate with the economic development of the country as well as with the possible decline in the importance of the agricultural sector in total national income of India. The corresponding rates of growth for rural population is assumed at 2 per cent and 1.5 per cent during 1961-71 and 1971-81 respectively.

TABLE I - Estimates of Population in India

(in million)

Year	Total	Rural	Urban
1960-61	439.2	360.36	78.84
1967-68	514.0	410.30	103.70
1973-74	596.0	463.00	133.00
1980-81	690.0	509.00	181.00

Source: The estimates of total population are taken from Fourth Five-Year Plan - Draft, Planning Commission, Government of India, New Delhi, 1969.

Expenditure Elasticity of Demand for Foodgrains

Once the rate of growth of population is determined the next step is to estimate the per capita income (or expenditure), and income (or expenditure) elasticity of demand for foodgrains. Expenditure elasticity can be computed from two sources of data, viz., (i) cross-section and (ii) time-series data. Because of the

absence of reliable market statistics for sufficiently long period, the estimates of expenditure elasticities are usually based upon cross-section data. Another methodological issue involved is that of the choice between value elasticity and quantity elasticity. For the long-term estimates of consumption the latter is more useful than the former. But there are certain difficulties in measuring quantity elasticities specially those arising from the problems of aggregation due to the qualitative differences in the commodities used. Hence it is the general practice to use value elasticity.

A number of attempts have been made in estimating the expenditure elasticity of foodgrains in India.² Among

2. See A.S. Patel, op.cit., pp.84-94. The estimates examined in the thesis were prepared and/or used by (i) Ansley Coale and E.M. Hoover: Population Growth and Economic Development in Low Income Countries, Oxford University Press, London, 1959, pp.124-127; (ii) R.P. Sinha: I—Food in India, Oxford University Press, London, 1961, pp.22-34 and pp.65-67; II—"An Analysis of Food Expenditure in India," Journal of Farm Economics, Vol.48, No.1, February 1966; (iii) National Council of Applied Economic Research: Long Term Demand for and Supply of Selected Agricultural Commodities 1960-61 to 1975-76, New Delhi, 1962; (iv) G.S.Maddala, "Demand for Foodgrains during the Third Five Year Plan," Indian Journal of Agricultural Economics, Vol.XV, No.2, April-June, 1960, pp.69-73; (v) A.K. Biswas and D.K.Bose: Papers on National Income and Allied Topics, Vol.II, Edited by V.K.R.V.Rao and others, Asia Publishing House, Bombay, 1961; (vi) B.K.Barpujari and Kailash Chandra: Papers on National Income and Allied Topics, Vol.II, Edited by V.K.R.V.Rao and others, Asia Publishing House, Bombay, 1961; (vii) Report of the Foodgrains Enquiry Committee, Government of India, New Delhi, 1957; (viii) S.N.Srinivas Iyengar: Some New Estimates of Engel Elasticities Based on the National Sample Survey Data, ISI Working Paper No.299, December, 1964; (ix) H.F.Lydall and M.Ahmed: An Exercise in Forecasting Consumer Demand and Taxation Yields in 1965-66, Mimeograph Working Paper, ISI, 1961; (x) Ram Dayal:I: "Demand for Food in the Second Five Year Plan," Agricultural Situation in India, Vol.XI, No.7, October, 1956, pp.468-488, II: "Income and Price Effects on Demand for Foodgrains," Indian Journal of Agricultural Economics, Vol.XIX, Nos. 3 & 4, July-December 1964, pp.232-243; (xi) Food and Agriculture Organization: Agricultural Commodities Projection for 1970 — FAO Commodity Review 1962, Special Supplement, FAO, Rome, 1962; (xii) Pushpam Paul and Ashok Rudra, "Demand Elasticity for Foodgrains," The Economic Weekly, Vol.XVI, No.48, November 28, 1964.

these H.F. Lydall and M. Ahmed have provided separate estimates for rice, wheat, other cereals and pulses. These estimates are considered to be more realistic and complete because they are based on the method of concentration curves which is considered to be the most reliable statistical method for the estimation of expenditure elasticities from grouped data.³ These estimates of expenditure elasticities are used in this paper.

In the context of a developing economy we cannot use any particular estimates for a long time to come. Changes in consumption habits do take place in such an economy. Therefore, we have used lower estimates after 1973-74. The values of elasticities after 1973-74 as well as the dividing line at 1973-74, it must be agreed, are rather arbitrary.

Table II - Estimates of Expenditure Elasticities

	Rice	Wheat	Other cereals	Pulses
Rural				
Upto 1973-74*	0.63	1.54	0.31	0.77
After 1973-74	0.50	1.20	0.10	0.70
Urban				
Upto 1973-74*	0.24	0.68	0.09	0.60
After 1973-74	0.15	0.50	0.05	0.50

* Estimates of G. F. Lydall and M. Ahmed, op.cit.

Estimation of Income

The projection of income is an equally/difficult task. A number of assumptions have to be made for such projection. In this study we have relied upon the estimates of the Planning

3. See N.S. Iyengar, "On a Method of Computing 'Engel Elasticities' from Concentration Curves," Econometrica, Vol.28, No.4, October, 1960, pp. 882-891.

Commission.⁴ The estimates of income as are available in this publication are in terms of aggregate and hence they need to be separated for rural and urban population. No such break-up is available in any official source. One such attempt was made by V.K.R.V. Rao,⁵ whose methodology with slight modification is used for our analysis.⁶

Table III.- Estimates of Income

(Rs. crores at 1960-61 prices)

Year	Rural	Urban	Total
1960-61	9390.00	4800.00	14190.00
	(66.17)	(33.83)	(100.00)
1967-68	97.89	6771.00	16560.00
	(59.11)	(40.89)	(100.00)
1973-74	12005.00	10565.00	22570.00
	(53.19)	(46.81)	(100.00)
1980-81	15732.00	18468.00	34220.00
	(46.00)	(54.00)	(100.00)

Figures in brackets indicate percentages to the total.

Estimates of Expenditure

To arrive at the expenditure estimates, since our elasticity estimates are in terms of expenditure, no fully satisfactory method is available. We have tried to derive disposable income by deducting direct taxes and corporate

4. Fourth Five-Year Plan 1969-74 —Draft, Planning Commission, Government of India, 1969.

5. V.K.R.V. Rao, "Economic Growth and Rural-Urban Income Distribution," The Economic Weekly, Vol.XVII, No.8, February 20, 1965.

6. The modification made is: Rao's estimate of income distribution is related to the period 1950-51 to 1960-61. He has shown an absolute decline in the rural sector's income originating from industries. The recent emphasis on rural industrialisation and dispersal of industries in rural areas as well as the emphasis on agro-industries, etc., suggest that the declining trend in industrial income in the rural areas is likely to be halted.

savings from private income estimates. Thereafter, personal savings are deducted from the disposable income and the private consumption estimates are arrived at. According to this method, total expenditure as a percentage of income for the rural sector comes to 96.22 per cent in 1950-51 and 96.07 per cent in 1960-61. The corresponding estimates for the urban sector are 89.66 per cent and 82.06 per cent respectively for 1950-51 and 1960-61.⁷ The crux of the matter is that the income-expenditure ratio has remained almost the same for the rural sector, but in the urban sector there was a substantial decline in the percentage of expenditure to income during 1950-51 to 1962-63.⁸ It is the low level of income in the rural areas and consequent high level of demand for the consumption of basic goods which is the principal reason behind a constant ratio. As such, for years to come, very large part of incremental income in the rural sector will continue to be spent rather than saved. It is assumed that the percentage of total expenditure to total income in the rural areas is likely to experience only a moderate fall. Therefore such percentages can be fixed at 96, 93 and 91 respectively for the years 1967-68, 1973-74 and 1980-81. These percentages are then applied to rural income estimates arrived at earlier (Table III). The rural expenditure estimates for the different years are deducted from the official estimates of the total expenditure to arrive at the expenditure estimates of the urban sector. The rural-urban break-up of the total expenditure thus arrived at are given in Table IV.

7. For the exercise carried out see A.S. Patel, *op.cit.*, pp. 110-116. It may be noted here that the required data are not available for future years and therefore for the future years ratios selected are arbitrary.

8. See also "Estimates of Saving and Investment: 1950-51 to 1962-63," Reserve Bank of India Bulletin, Vol. XIX, No. 3, March, 1965.

TABLE IV - Rural-Urban Break-Up of Total Expenditure

(Rs. crores at 1960-61 prices)

	1960-61	1967-68	1973-74	1980-81
Rural ..	9161.00	9397.00	11165.00	14316.00
Urban ..	3999.00	5524.00	8394.00	13755.00
Total ..	13160.00	14921.00	19559.00	28071.00

The rural-urban estimates of the total expenditure have been divided by the projected rural-urban population (Table I) and the per capita expenditure estimates are arrived at as given in Table V.

TABLE V - Rural-Urban Estimates of Per Capita Expenditure (Rs. at 1960-61 prices)

	1960-61	1967-68	1973-74	1980-81
Rural ..	254	229	241	281
Urban ..	507	533	631	760
Total ..	300	290	328	407

On the basis of these figures we have arrived at the rate of growth of per capita expenditure (Table VI).

TABLE VI - Rates of Growth of Per Capita Expenditure

	1960-61 to 1967-68	1968-69 to 1973-74	1974-75 to 1980-81
Rural	-	0.9	2.2
Urban	0.7	2.8	2.7
All-India	-	2.1	2.5

Projection of Demand for Foodgrains

The projection of demand for foodgrains is carried out for three separate periods: (a) 1960-61 to 1967-68, (b) 1968-69 to 1973-74, and (c) 1974-75 to 1980-81. In order to arrive at the demand projection of rice, wheat, other cereals and pulses it is required to divide the actual consumption of these commodities in 1960-61— the base year — into rural and urban parts. We have made use of the data on consumption available in NCAER's study of "Long Term Projections of Demand for and Supply of Selected Agricultural Commodities 1960-61 to 1975-76" and the NSS data of 1960-61 (16th round) and arrived at the estimates of weighted (weight being rural-urban population) rural-urban consumption ratio for rice, wheat, other cereals and pulses which come to 89:11, 68:32, 93:7 and 82:18 respectively. Due to fluctuations in the net availability of foodgrains in India the actual requirement of foodgrains for the base year (1960-61) is arrived at by averaging out the net availability for the triennium ending 1961-62. The rural-urban estimates of consumption of rice, wheat, other cereals and pulses in 1960-61 thus arrived at are presented in Table VII.

Table VII — Net Consumption Requirement of Foodgrains in 1960-61

(million tonnes)

	Rice	Wheat	Other cereals	Total cereals	Pulses	Total food-grains
Rural	28.40	8.85	17.39	54.64	8.67	63.31
Urban	3.51	4.17	1.31	8.99	1.90	10.89
All-India	31.91	13.02	18.79	63.63	10.57	74.20

Source: Compiled from the Bulletin on Food Statistics, February, 1969, Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Co-operation, Government of India, Delhi, 1969.

Rates of Growth of Demand for Foodgrains

The rates of growth of demand for rice, wheat, other cereals and pulses are then estimated for different periods. This is done by taking into account the rate of growth of population, growth of per capita expenditure and the expenditure elasticity of demand for the rural as well as the urban sectors (Table VIII).

Table VIII — Rates of Growth of Demand for Rice, Wheat, Other Cereals and Pulses in the Rural and Urban Sectors

	1960-61 to 1967-68	1968-69 to 1973-74	1974-75 to 1980-81
Rural			
Rice	2.00	2.30	2.60
Wheat	2.00	3.10	4.14
Other cereals	2.00	2.10	1.72
Pulses	2.00	2.40	3.00
Urban			
Rice	4.17	4.90	4.91
Wheat	4.48	5.90	5.85
Other cereals	4.06	4.50	4.64
Pulses	4.42	5.90	5.90

From Table VIII it seems that the demand for all foodgrains will increase over a period of time — both in the rural as well as urban sectors. The estimates of net demand are presented in Table IX.

The estimates presented in Table IX are in terms of requirements for human consumption and in order to obtain total requirements allowance is to be made for seeds, feed

Table IX.— Estimates of Net Demand for Foodgrains

(million tonnes)

	Rural Sector					Urban Sector				
	1960-	1967-	1970-	1973-	1980-	1960-	1967-	1970-	1973-	1980-
	61	68	71	74	81	61	68	71	74	81
1	2	3	4	5	6	7	8	9	10	11
1. Rice	28.40	32.62	35.20	37.43	44.76	3.51	4.67	5.35	6.23	8.69
2. Wheat	8.85	10.16	11.24	12.23	16.25	4.17	5.66	6.68	7.98	11.88
3. Other cereals	17.39	20.44	21.85	23.07	25.95	1.31	1.73	1.96	2.25	3.09
4. Total cereals	54.64	63.22	68.29	72.73	86.96	8.99	12.06	13.99	16.46	23.66
5. Pulses	8.67	10.02	10.84	11.58	14.28	1.90	2.57	3.03	3.63	5.39
6. Foodgrains	63.31	73.24	79.13	84.31	101.24	10.89	14.63	17.02	20.09	29.05

(continued below)

All-India				
1960-	1967-	1970-	1973-	1980-
61	68	71	74	81
12	13	14	15	16
31.91	37.29	40.55	43.66	53.45
13.02	15.82	17.92	20.21	28.13
18.79	22.17	23.81	25.32	29.04
63.63	75.28	82.28	89.19	110.62
10.57	12.59	13.87	15.21	19.68
74.20	87.87	96.15	104.40	130.29

and wastage. Conventionally 12.5 per cent of the gross availability is accounted for by such needs. This is added to the figures of projected demand for human consumption. The gross demand for foodgrains thus arrived at is presented in Table X.

Implications of Demand Projections

A number of significant conclusions emerge from this discussion. Firstly, during the coming decade, the demand for foodgrains will continue to increase rapidly. Second, the demand for foodgrains in the urban/^{areas} will increase at a substantially higher rate. This is evident from the rising ratio of foodgrain requirement of urban to that of rural areas. The ratio was 0.172 in 1960-61 and increased to 0.226 in 1973-74 and to 0.272 in 1980-81. This has important implications for the policy for mobilizing marketable surplus. Third, the demand for superior cereals, i.e., rice and wheat, will increase more rapidly than the overall demand for foodgrains. This is true for rural as well as for urban areas. This is again evident from the increasing ratio of superior to inferior cereals. The estimates of this ratio for rural areas are: 2.14, 2.15 and 2.35 in 1960-61, 1973-74 and 1980-81 respectively. The corresponding estimates for urban areas are 5.86, 6.32 and 6.66 respectively for 1960-61, 1973-74 and 1980-81. The important implication of the later two points is that the requirement of marketable surplus of foodgrains in general and of superior cereals in particular will increase at a substantially rapid rate.

TABLE X - Estimates of Gross Demand for Foodgrains

(million tonnes)

(1)	Rural Sector					Urban Sector				
	1960-	1967-	1970-	1973-	1980-	1960-	1967-	1970-	1973-	1980-
	61 (2)	68 (3)	71 (4)	74 (5)	81 (6)	61 (7)	68 (8)	71 (9)	74 (10)	81 (11)
1. Rice	32.46	37.62	40.23	42.78	51.15	4.01	5.34	6.11	7.12	9.93
2. Wheat	10.11	11.61	12.85	13.98	18.57	4.77	6.47	7.63	9.12	13.58
3. Other cereals	19.87	23.36	24.97	26.37	29.66	1.50	1.98	2.24	2.57	3.53
4. Total cereals	62.44	72.59	78.05	83.13	99.38	10.28	13.79	15.98	18.81	27.04
5. Pulses	9.91	11.45	12.39	13.23	16.32	2.17	2.94	3.46	4.15	6.16
6. Foodgrains	73.35	83.70	90.44	96.36	115.70	12.45	16.72	19.44	22.96	33.20

(continued below)

All India				
1960-	1967-	1970-	1973-	1980-
61	68	71	74	81
(12)	(13)	(14)	(15)	(16)
36.47	42.96	46.34	49.90	61.08
14.88	18.08	20.48	23.10	32.15
21.37	25.34	27.21	28.94	33.19
72.72	86.38	94.03	101.94	126.42
12.08	14.39	15.85	17.38	22.48
85.80	100.42	109.88	119.32	148.90