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Working Paper No. 75

THE FOODGRAIN ECONOMY OF TAMIL NADU: PROBLEMS AND PROSPECTS

by

R. N. PODUVAL

Assisted by

C. ANNADURAI

MADRAS INSTITUTE OF DEVELOPMENT STUDIES

79, SECOND MAIN ROAD, GANDHI NAGAR, ADYAR

MADRAS 600 020

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PREFACE

Perceptions of the food problem have undergone significant changes in recent years. No longer can the food problem be conceived solely in terms of the relationship between food supply and population growth. This relationship has a Malthusian flavour. It is now being increasingly recognized that availability of food by itself is not a sine qua non for alleviating hunger defined as inadequate food intake (in terms of calories). Along with availability, there should also be accessibility to food in the sense of income or purchasing power which depends on provision of employment opportunities and adoption of egalitarian measures. It is, therefore, necessary to view the food problem in the broader context of economic and social development. The analysis of the foodgrain economy of Tamil Nadu has been set in this broader framework.

The opportunity to understand the complexities of the food economy of the country and to be involved in the formulation of food policies arose when I was with the Ministry of Food and Agriculture, Government of India, in the late fifties and early sixties, as Economic and Statistical Adviser. Subsequently, my assignment with the United Nations Food and Agriculture Organization as Planning Economist, enabled me to view food and agricultural development in an international context.

The suggestion that I should undertake a study of the food economy of Tamil Nadu came from Dr. C. T. Kurien, Director, Madras Institute of Development Studies (MIDS). In view of the current emphasis on studies of regional problems, I felt that such a study would be opportune. However, in the light of data availability and the need to make the study manageable, I confined the analysis to the foodgrain economy.

For undertaking the study, The Madras Institute of Development Studies provided the necessary facilities for which I am grateful. Mr. C. Annadurai, Research Assistant in MIDS provided overall assistance which also included the collection and tabulation of State-level and District-level data and meticulous scrutiny of the manuscript. In fact, he worked as a Technical Assistant. I am greatly indebted to him. I am also grateful to Mr. Abdul Huq, Assistant Professor of Statistics, Madras Christian College, for helping me in statistical calculations. Dr. T. K. Velayudham, former Director, Division of Monetary Economics, Reserve Bank of India, went through each of the Chapters and offered useful suggestions. He regarded this as a debt owed by him to his guru. Finally, I would like to express my gratitude to the administrative staff of MIDS for the secretarial assistance rendered to me.

Introduction

There has been no systematic study of the foodgrain economy of Tamil Nadu. What has been attempted so far has been the study of particular aspects such as changes in the cropping pattern and impact of the green revolution. No comprehensive and integrated study of the various facets of the foodgrain economy of the State exists. The study entitled "The Foodgrain Economy of Tamil Nadu : Problems and Prospects", should, therefore, help in filling this gap.

The study seeks to make an empirical and analytical contribution to a complex but important subject. The analysis has been conducted not only at the State level but also at the district, at which level, it becomes more meaningful.

Especially in the matter of food, the whole economy of the country has to be regarded as one. Hence although the Study focusses on Tamil Nadu, the food economy of the State has been analysed within the framework of the national food economy.

The study consists of nine chapters. Chapter I views the foodgrain economy in the context of the over-all economy of the State, as well as its relative position in the national foodgrain economy. While indicating the sense in which the State may be said to be relatively self-sufficient in cereals, the Chapter poses the problem of hunger, signifying inadequate calorie intake.

The second chapter analyses the changes in the cropping pattern within foodgrains and the causal factors underlying this development. An attempt has also been made to measure the importance a crop gets in a district.

The impact of the adoption of the new technology signified by the seed-fertilizer technology is examined in the third chapter. Whether the adoption of the new technology has reached a plateau and what have been the constraints to further growth in productivity are also discussed. The performance of the State in comparison with other States is indicated.

The fourth chapter devotes attention to the hitherto neglected coarse cereals. This chapter is a revised version of the Seminar Paper entitled "The Role of Coarse Cereals in the Foodgrain Economy : A Case Study of Tamil Nadu" published in the Bulletin : Madras Development Seminar Series Vol. XV: No:9. It analyses the importance of coarse cereals in production, consumption, and in other uses such as feed and industrial raw material and suggests a strategy for the development of these crops.

As in respect of coarse cereals, so also in respect of pulses, a protein-rich food, insufficient attention has been paid to raise the level of productivity which is the lowest in the State. The problems confronting the production and consumption of pulses have been analysed in Chapter V.

The emerging problems of the foodgrain economy of the State form the theme of succeeding chapters. The nature of instability in foodgrain production to which the State is particularly prone, and the measures for softening the impact of fluctuations are discussed in Chapter VI. Chapter VII analyses the consumption pattern as revealed by NSS Consumer Expenditure Surveys and underlines the magnitude of undernutrition in the sense of inadequate calorie intake.

The changing role of public intervention in the foodgrain economy and the often conflicting objectives of ensuring a remunerative price to the producer and meeting the minimum consumption requirements of low income consumers form the theme of Chapter VIII. It is a revised version of a Seminar Paper. on "Public Intervention in the Foodgrain Economy : Recent Tamil Nadu Experience" published in the Bulletin : Madras Development Seminar Series Vol.XIV No:9.

The concluding chapter (Chapter IX) entitled "Implications for Policy" examines the relationship between growth in foodgrain production and growth in demand stemming from population and income growth. It makes an estimate of the staple food (rice) requirements in 1991 and the extent to which productivity has to be raised to meet the projected demand. The other dimension of the food problem, namely the prevalence of hunger, is also analysed in this chapter. Food availability by itself cannot eradicate hunger; it has to be backed up by measures aimed at "entitlement raising".

Chapter I

Foodgrains in the State Economy

1. The Crucial Role of Foodgrains

Foodgrains play a crucial role in the economy of the State. As the most essential wage good, the availability and price of foodgrains determine the level of living as well as the pace of development of the economy. A lagging foodgrain sector pushes up the price of wage goods which in turn raises the cost of living and price of labour and ultimately result in higher costs in the economy. Thus there is a cascading effect when there is a setback to foodgrain production.

Growing urbanisation has important implications for the foodgrain sector. It necessitates increased marketed surplus to satisfy the food demand of the urban population. According to the Census of Population 1981, a third of the population of Tamil Nadu is urban. By 1991, the urban population in the State is projected to increase to 37 percent of the total population.[1/] Urbanization necessitates not only greater marketed surplus but also more commitment to public distribution of foodgrains.

Although the operation of Engel's Law* can be expected to slow down the demand for foodgrains, lack of accessibility to food or lack of purchasing power on the part of disadvantaged groups such as agricultural labourers and marginal farmers has been acting as a drag on the effective demand for foodgrains. If the income and purchasing power of these groups are raised through employment generating schemes, their effective demand will begin to impinge on the foodgrains market. Thus the current demand for foodgrains does not reflect the "latent" demand, the

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* Engel's Law states that the proportion of a family's budget devoted to food declines as the family's income

satisfaction of which would result in further pressures on the foodgrain sector.

2. The Foodgrain Sector within State Agriculture

Foodgrains dominate the agricultural economy of the State much in the same way as agriculture dominates the over-all economy. The gross area under foodgrains as a proportion of total gross cropped area has been of the order of 67 per cent (average for the triennium ending with 1981-82). Of the gross irrigated area, 45 per cent has been under foodgrains (average for the triennium ending with 1981-82). Of the foodgrains, paddy has been the principal crop accounting for 54 per cent of total area under foodgrains. The predominence of this crop is even more marked at the district level. In Thanjavur district, regarded as the "rice bowl" of the State, almost the entire cropped area is occupied by paddy; in North Arcot, its proportion to total area under foodgrains is 87 per cent and in South Arcot, about 78 per cent. In contrast to paddy, coarse grains, cholam (jowar), cumbu (bajra), ragi and minor millets have been witnessing a decline in importance from the standpoint of area. Even so, they constitute about a third of total area under foodgrains (average for the triennium ending with 1981-82). Pulses, the other component of foodgrains, occupy 11 per cent of foodgrain acreage. The importance of foodgrains as a generator of employment and incomes is thus evident.

Foodgrains production is specially important for the small holders (having operational holdings below 2 hectares) as they devote a greater proportion of their area to cultivation of foodgrains than medium and large farmers. According to All-India Report on Agricultural Census, 1970-71[2/]

71 per cent of the small holders' cropped area in the State are under foodgrains. It may be mentioned that the proportion of acreage of small holders to total area of operational holdings in the State has increased from 37.6 per cent in 1970-71 to 41.9 per cent in 1976-77 and to 47.1 per cent in 1980-81. The role of the small holder in the foodgrain economy is thus becoming even more marked.

The monthly per capita consumer expenditure on food in rural and urban areas of Tamil Nadu as a percentage of total consumer expenditure has been of the order of 70 per cent and 64 per cent respectively in 1977-78.[3/] Food comprises besides foodgrains, milk, and milk products, edible oils, meat, egg and fish, vegetables, fruits and nuts, sugar, salt, spices, beverages, refreshments etc. Of the expenditure on food, foodgrains alone constituted 60 per cent in rural areas. For the bottom quartile groups in the rural areas, the expenditure on foodgrains is as much as 80 per cent of the total expenditure on food. Major part of nutrients in food is derived from cereals and starchy roots. Of the total calorie intake, more than 82 per cent in rural areas and 71 per cent in urban areas are derived from cereals, starchy roots, and sugar. Hence foodgrains dominate in the calorie intake.

3. Relative position of the State in All-India Foodgrain Production

Table I indicates the percentage share of the States in the production of foodgrains, 1978-79 to 1980-81 average.[4/] Subsequent years have not been considered as these were characterised by low rainfall in the State affecting the level of production. It will be noticed that Tamil Nadu stands sixth in the production of foodgrains; its share

in all-India production being 5.6 percent; in rice the State stands third, next to Andhra Pradesh and West Bengal and second in the production of ragi (next to Karnataka).

The share of Tamil Nadu (1973-74 to 1975-76 average) in the national production of rice was 11.3 per cent. It has declined to 10.3 per cent (1978-79 to 1980-81 average). This development may be largely ascribed to the emergence of States other than the traditional producers such as Punjab and Haryana whose share in total production of rice increased during the period from 2.9 to 6.3 per cent and 1.2 to 2.3 per cent respectively.

In a normal year (when the monsoon rains do not fail), Tamil Nadu is relatively self-sufficient in rice, the principal foodgrain. However, it is not a surplus State in rice production as Andhra Pradesh or Punjab or Haryana. Nor is it a deficit State like Kerala or West Bengal. Surplus States have been defined "as States where per capita cereal production in higher than the all-India average and per capita net supplies of cereals from the Central Government Pool is less than the all-India average. Deficit States are identified as those where per capita cereal production is lower and per capita net supply from the Central Pool is higher than the all-India average.[5/] On this basis, Andhra Pradesh, Haryana, Madhya Pradesh, Orissa, Punjab and Uttar Pradesh are regarded as surplus States in rice while deficit States include Assam, Bihar, Kerala, Maharashtra and West Bengal. Since Tamil Nadu is not included in either category, it is regarded as relatively self-sufficient (in a normal year) in rice. It may be mentioned that certain sections of the population in Madras prefer to consume Molakolukulu rice of Nellore and fine Kichidi varieties of Vijayawada and Hyderabad, rice produced

Table I: Percentage Share of States in the Production of Foodgrains (1978-79 to 1980-81 Average)[1/]

State	Rice	Jowar	Bajra	Maize	Ragi	Wheat	Barley	Total cereals	Gram	Total Pulses	Total Food grain
Andhra Pradesh	14.0	12.4	6.7	7.1	10.2	-	-	8.6	0.4	3.6	8.1
Assam	4.4	-	-	0.2	-	0.3	-	2.0	-	0.4	1.9
Bihar	9.8	0.1	0.1	15.0	3.7	6.9	4.4	7.5	2.8	6.5	7.4
Gujarat	1.0	5.1	27.5	4.2	1.4	3.6	0.2	3.6	1.0	2.2	3.5
Haryana	2.3	0.3	7.7	1.1	-	10.0	6.5	4.6	14.6	6.7	4.7
Himachal Pradesh	0.2	-	-	7.0	0.2	0.9	1.9	0.8	0.3	0.3	0.8
Jammu & Kashmir	1.0	-	0.2	6.7	-	0.6	0.4	1.0	-	0.3	1.0
Karnataka	4.5	14.9	5.0	6.5	51.1	0.6	-	5.7	1.7	5.9	5.7
Kerala	2.6	-	-	-	0.1	-	-	1.1	-	0.2	1.0
Madhya Pradesh	6.3	12.0	1.8	9.8	0.2	8.4	9.2	7.5	22.5	18.4	8.5
Maharashtra	4.3	43.9	12.7	2.0	7.3	2.8	0.4	8.0	3.5	9.1	8.1
Manipur	0.5	-	-	0.2	-	-	-	0.2	-	-	0.2
Meghalaya	0.3	-	-	0.2	-	-	-	0.1	-	-	0.1
Nagaland	0.1	-	-	0.2	-	-	-	0.1	-	-	0.1
Orissa	7.8	0.2	0.1	1.8	6.4	0.3	-	3.9	0.5	7.3	4.2
Punjab	6.3	-	1.5	10.6	-	22.2	3.9	10.3	4.7	2.4	9.6
Rajasthan	0.3	2.5	18.0	11.5	-	7.6	25.8	4.6	23.2	12.2	5.3
Tamil Nadu	10.3	5.4	7.2	0.4	13.3	-	-	6.0	0.1	1.9	5.6
Tripura	0.7	-	-	-	-	-	-	0.3	-	-	0.3
Uttar Pradesh	9.3	3.1	11.2	14.1	5.3	33.2	45.7	17.0	23.3	20.0	17.2
West Bengal	13.4	-	-	0.9	0.3	2.2	1.5	6.7	1.4	2.5	6.3
Union Territories	0.6	0.1	0.3	0.5	0.5	0.4	0.1	0.4	-	0.1	0.4
All-India	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Source : Bulletin on Food Statistics 1981-82: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

in Andhra Pradesh. Again, a coarse variety of Kuruvai produced is exported to Kerala as it is not popular with the people of Tamil Nadu".[6/] However, it is not possible to quantify these movements of rice into and out of the State in so far as they take place by road.

The following table gives State-wise population, cereal production and per capita cereal production in 1981:

Table II: Population, Cereal Production and Percapita Cereal Production in 1981.

State	Population (in millions)	Cereal Production[1/] (million tons)	Percapita Cereal Production (in kg.)
Andhra Pradesh	54	10.9	202
Assam	20	2.4	120
Bihar	70	7.5	107
Gujarat	54	4.7	124
Haryana	13	5.7	438
Himachal Pradesh	4	1.0	250
Jammu & Kashmir	6	1.2	200
Karnataka	37	6.7	181
Kerala	25	1.3	52
Madhya Pradesh	52	10.4	200
Maharashtra	63	8.5	135
Orissa	26	4.5	173
Punjab	17	13.2	776
Rajasthan	34	5.6	165
Tamil Nadu	48	7.2	150

contd.10.

Table II (contd.)

State	Population (in millions)	Cereal Production[1] (million tons)	Percapita Cereal Production[2] (in kg.)
Uttar Pradesh	111	22.0	198
West Bengal	55	6.3	115
All-India	685	121.8	178

1/ Refers to 1981-82 production
2/ States where percapita cereal production is higher than the All-India average have been Andhra Pradesh, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Punjab and Uttar Pradesh. In Tamil Nadu, percapita cereal production has been less than the All-India average but not less to the same extent as the other States except Rajasthan and Orissa.

From Table I, it may noted that the production of pulses in the State has been very low, constituting less than 2 percent of all-India production. The State is thus deficit in pulses, a major source of protein supply. The deficit is being met from surplus producing States such as Madhya Pradesh, Rajasthan, Uttar Pradesh, Karnataka and Andhra Pradesh.

4. The prevalence of hunger

Although the State is relatively self-sufficient in cereals, the per capita net availability of cereals has

been declining over the years. The per capita net availability was 152.5 kg. in 1972-73 (average for the triennium ending with 1972-73). It declined to 136.4 kg. in 1981-82 (average for the triennium ending with 1981-82). At the all-India level too, the same tendency has been discernible. Two factors have been responsible for this development: (a) lack of a sustained increase in cereal production, and (b) population growth necessitating a rate of growth in cereal production out-stripping the rate of growth of population. These developments are discussed in detail in a subsequent chapter.

Relative self-sufficiency in cereals has also not eliminated the problem of hunger, signifying inadequate calorie intake. From the calorie intake data specially compiled by the NSS for the Food and Agriculture Organisation of the United Nations (FAO) for 1971-72, it is seen that if the requirement of calories per consumer unit (0.80 is used for conversion from per capita to per consumer unit) is taken to be 2700, the percentage of households consuming less than this in the rural areas of the State has been 64 and in urban areas 68.[7] Based on the quick tabulation of NSS household consumer expenditure data from the 32nd round (July 1977 to June 1978), it was estimated for the Sixth Five Year Plan, 1980-85, that 55.68 per cent of the people in the rural areas of the State and 44.79 per cent in urban areas had incomes which could not provide a minimum daily calorie intake of 2400 per person in rural areas and 2100 in urban areas.

Increasing foodgrain output is a necessary but not a sufficient condition for resolving the hunger problem. The cause of hunger is to be traced to the lack of accessibility to food or lack of "exchange entitlement".[8]

This arises from lack of ownership of productive assets including skills and inadequacy of what a person can command through labour or through welfare programmes. In the ultimate analysis, hunger results from either lack of means to produce food directly or indirectly gain access to available supplies of food. The reduction of hunger is, therefore, a matter of "entitlement raising".[9]

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9. Ibid.

CHAPTER II

Changes in the cropping pattern within foodgrains

Foodgrains continue to occupy about 70 per cent of the gross cropped area in the State. Changes in the cropping pattern are, therefore, significant not so much in respect of total foodgrains as in respect of their components, cereals and their constituents, and pulses. In other words, it is changes within the foodgrains group that merit examination. Moreover, it has to be noted that changes in the cropping pattern are much more perceptible at the district than at the State level.

I. State level changes

1. Overall changes in cropping pattern

Changes in the cropping pattern are reflected in the gross cropped area under the respective crops. How the acreage under foodgrains as a whole has behaved in relation to area under foodcrops other than foodgrains, and in relation to that under non-food crops over the period 1960-1980, broken down into three sub-periods is indicated in Table I. To even out annual variations in acreage, a three year average has been taken for each of the triennium ending with 1961-62, 1971-72, and 1981-82.

Table I: Proportion of gross cropped area under foodgrains, foodcrops other than foodgrains and non-food crops to total gross cropped area (Per cent).

	Average of triennium ending with 1961-62	Average of triennium ending with 1971-72	Average of triennium ending with 1981-82
Foodgrains	70.9	68.9	67.1
Food Crops other than foodgrains 1/*	4.3	7.0	9.5
Non-food crops	24.8	24.1	23.4

* These comprise of condiments and spices, sugarcane, fruits and vegetables.

It will be seen that the proportion of acreage under foodgrains has undergone a decline, from 70.9 per cent of gross cropped area in the triennium ending with 1961-62 to 68.9 per cent in the triennium ending with 1971-72 and further to 67.1 per cent in the triennium ending with 1981-82. On the other hand, the area under food crops other than foodgrains has more than doubled while the area under non-food crops has registered a slight decline. It appears, therefore, that food crops other than foodgrains have gained at the expense of foodgrains, the most important of which has been sugarcane whose area since 1971-72 has witnessed a marked increase.

2. Changes within cereal crops

Important cropping pattern changes have taken place within cereal crops. The major change has been the increase in area under paddy and decrease in area under coarse grains. The following table indicates the proportion of area under paddy, cholam (jowar), cumbu (bajra), ragi and other cereals to total gross cropped area.

Table II: Proportion of gross cropped area under cereal crops (per cent)

	Average of triennium ending with 1961-62	Average of triennium ending with 1971-72	Average of triennium ending with 1981-82
Paddy	34.6	35.4	36.6
Cholam	10.8	10.1	9.6
Cumbu	6.9	6.3	4.9
Ragi	5.0	4.0	3.1
Other cereals[2/]*	7.6	6.4	4.6

* Other cereals refer to Varagu, Panivaragu and Samai.

Over the period 1961-62 to 1981-82 the proportion of area under paddy has increased from 34.6 per cent of the gross cropped area to 36.6 per cent. On the other hand, the proportion of area under coarse grains (cholam, cumbu, ragi and other cereals) has registered a decline. The decline in the proportion of area under coarse grains is most marked in respect of cumbu, ragi and other cereals. Cropping pattern changes within cereal crops strongly suggest inter-crop substitution of low value cereals by high value paddy.

Unlike the proportion of acreage under coarse grains, that under pulses has witnessed an increase. This is in marked contrast to the behaviour of pulse acreage at the national level where the proportion of area under pulses has been showing a decline since 1960-61. The proportion of gross cropped area under pulses in the State is indicated below:

Table III: Proportion of gross cropped area under pulses

(per cent)

	Average of triennium ending 1961-62	Average of triennium ending 1971-72	Average of triennium ending 1981-82
Pulses	6.0	6.8	8.1

It may be noted that pulses are grown largely as an inter-crop (mixed crop) and consequently the increase in the proportion of gross cropped area may not wholly represent an extensive margin of cultivation.

3. Causal factors accounting for changes in the cropping pattern

The most important factors accounting for changes in the cropping pattern have been, expansion of irrigation, relative profitability of the crops and changes in consumption pattern.

There has been a close relationship between expansion of irrigation and increase in paddy acreage while in respect of coarse grains an inverse relationship has been noticeable. In the State, paddy has been the crop which has been mostly irrigated. The proportion of gross irrigated area under paddy to total area under paddy rose from 91.5 per cent in 1960-61 to 92.0 per cent in 1970-71 and to 91.9 per cent in 1981-82. The gross area irrigated under paddy increased consequently by 4.7 per cent between 1960-61 and 1970-71 and remained practically stationary between 1970-71 and 1981-82. In contrast to paddy, the percentage of irrigated area under coarse grains with the exception of cumbu has shown a decline. The following table indicates the extent of area irrigated under paddy and coarse grains.

Table IV: Percentage of area irrigated

	Paddy	Cholam	Cumbu	Ragi
1960-61	91.5	19.6	13.1	49.5
1970-71	92.0	17.3	13.9	45.9
1981-82	91.9	13.5	14.6	34.4

With the expansion of irrigation, the tendency of the farmer has always been to replace coarse grains with high value paddy. Thus while the area under paddy has expanded.

that under coarse grains has declined. The gross cropped area under cholam declined by 4.0 per cent between 1960-61 and 1970-71 and by 5.4 per cent between 1970-71 and 1981-82, cumbu area declined by 2.9 per cent and 29.3 per cent respectively and ragi area by 22.0 per cent and 25.1 per cent respectively.

The switch in area from low value coarse grains to high value paddy is also to be explained by the higher profitability from growing the latter. This became particularly pronounced with the adoption of the seed-fertilizer technology from the middle sixties. Studies in the Economics of Farm Management in Coimbatore district[3] covering the period 1970-71 to 1972-73 estimate that even under irrigated conditions the average (1970-72) net income per ha from cholam (jowar) has been only Rs.692.1; from cumbu (bajra) Rs.397.1; and that from ragi Rs.559.6 compared to the average net income from paddy of Rs.1,049.9. Thus the growing of paddy is about 152 per cent more profitable than cholam; 264 per cent more profitable than cumbu and 188 per cent more profitable than ragi. Since irrigation permits double and even triple cropping of paddy, the income differential in favour of paddy has been very pronounced indeed.

The influence of relative prices on cropping pattern is subsumed under profitability since the value of output is a function of yield per ha and price. As between price and productivity, it has been the latter which has had the predominant influence. Price "when confronted with the force of technological change has not been able to counter its pressure on areas"[4]

Changes in the consumption pattern determined by the level of income may also influence cropping pattern changes. Expenditure elasticity of demand in rural and

urban areas calculated from the N.S.S. 27th Round Consumer Expenditure Survey (1972-73) indicates that while for lower income groups in rural and urban areas of the state, the expenditure elasticity for coarse grains is positive, that for high income groups both in rural and urban areas is negative. This indicates that an upward shift in real income of the lower income groups will push up the demand for coarse cereals in rural areas but upto a point. What has been noticeable is that while the consumption of superior cereals (rice and wheat) per person per month in urban areas of the State has been higher than that in rural areas, the consumption of coarse cereals has been less, indicating a tendency to substitute the former for the latter. The N.S.S. data also reveal that over the period 1973-74 to 1977-78 while the consumption of coarse cereals especially jowar and bajra has gone up in rural areas, there has not been any perceptible change in urban consumption of these commodities.[5/*] Thus the income effect has reinforced the influence of other factors on the cropping pattern.

II. District-level Changes

4. Spatial disaggregation:

Spatial disaggregation of the data to district level is indicated in Table V. Foodgrains continue to dominate the economy of 9 districts (Chengalpattu; Dharmapuri; Madurai; South Arcot; Ramanathapuram; Coimbatore; Tiruchirappalli; Thanjavur and Pudukottai) in the sense of their

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* N.S.S. Twenty eighth and Thirty second rounds. For details vide chapter on Consumption Pattern.

having 60 per cent or more of the gross cropped area under foodgrains. The districts whose proportion has been less have been Tirunelveli, Salem, North Arcot, Nilgiris and Kanyakumari. While this is the picture when foodgrains are considered as a whole, wide differences emerge when the components of foodgrains are considered separately.

Over the period, the proportion of acreage under paddy has gone down in most of the districts. The districts showing an increase have been Chengalpattu, Madurai, Tirunelveli, Salem and Ramanathapuram. In Thanjavur, the decline in area may be ascribed to increase in area under food crops other than foodgrains particularly sugarcane. The acreage under this crop in this district increased from 3.8 thousand acres in 1960-61 to 5.7 thousand acreas in 1970-71 and to 6.2 thousand acres in 1979-80. In Kanyakumari, it is the marked increase in acreage under non-food crops (increasing from 18.9 thousand acres in 1960-61 to 24.3 thousand acres in 1970-71 and to 31.4 thousand acres in 1979-80) which has been the causal factor for the decline in the proportion of foodgrain area to gross cropped area.

The changes in coarse grain acreage in the districts has been markedly different from that of paddy. The proportion of cholam area has, over the period, increased in Tirunelveli, North Arcot, Coimbatore and Tiruchirapalli but it has gone down in the other important cholam growing areas such as Dharmapuri, Madurai and Salem. The proportion of area under cumbu has shown an increase only in South Arcot while in respect of ragi there has been an increase only in Dharmapuri. The order of magnitude of the decline in the proportion of area under the respective coarse grains may be seen in Table V.

Table V: Proportion of area (in per cent) under foodgrains and their components: Average of triennium ending with 1961-62, 1971-72, and for 1981-82

District	Foodgrains			Paddy			Cholam		
	1961-62	1971-72	1981-82	1961-62	1971-72	1981-82	1961-62	1971-72	1981-82
Chengalpattu	84.2	81.0	80.1	92.2	70.9	74.0	0.4	0.3	0.2
Dharmapuri[1]	-	78.8	74.4	-	10.7	10.3	-	11.9	11.4
Madurai	64.0	64.0	65.4	23.7	21.6	25.5	21.3	21.2	19.6
South Arcot	68.4	67.6	66.0	39.3	43.3	37.7	6.9	5.0	3.5
Tirunelveli	59.4	60.2	50.4	27.9	24.7	28.8	5.8	6.1	6.2
North Arcot	64.8	62.3	56.1	36.4	40.7	31.7	7.5	5.6	9.1
Salem	76.8	62.9	54.3	10.5	14.5	14.7	15.6	18.2	15.0
Ramanathapuram	67.9	69.1	69.2	36.0	41.1	50.0	2.3	2.0	2.5
Coimbatore	61.1	62.9	60.5	12.3	11.6	8.3	22.8	24.1	31.0
Tiruchirapalli	73.9	71.9	74.8	26.2	27.3	26.1	16.6	16.6	22.4
Thanjavur	85.0	83.1	86.9	78.2	73.3	72.6	0.2	0.1	0.01
Nilgiris	15.0	14.1	9.6	6.7	6.0	5.6	0.1	0.3	0.1
Pudukottai[3]	-	-	69.8	-	-	54.7	-	-	0.2
Kanyakumari	57.6	54.2	46.0	53.6	51.1	45.3	0.06	0.2	N

contd.....

District	Cumbu			Ragi			Other cereals			Pulses		
	1961-62	1971-72	1981-82	1961-62	1971-72	1981-82	1961-62	1971-72	1981-82	1961-62	1971-72	1981-82
engalpattu	1.5	1.8	1.1	7.2	5.4	3.3	1.6	0.1	0.4	1.1	1.6	1.0
armapuri[1]	-	2.9	2.0	-	14.8	17.2	-	14.8	14.2	-	19.9	19.4
durai	3.0	4.5	3.0	2.4	1.6	0.7	9.2	10.2	7.5	4.4	5.3	9.1
uth Arcot	7.1	7.8	13.1	3.8	3.0	1.8	8.7	5.4	4.1	2.5	3.1	6.7
runelveli	13.3	13.7	10.2	1.6	1.8	1.4	4.1	5.3	2.7	6.7	9.7	7.1
rth Arcot	2.9	2.5	1.9	5.3	4.0	2.2	6.8	4.4	5.9	6.0	5.1	4.7
lem	10.1	11.9	3.9	14.5	6.8	6.2	13.1	5.4	4.4	13.0	6.2	9.2
nanathapuram	10.0	8.2	4.4	5.8	4.7	3.4	10.9	10.3	5.3	2.9	2.9	3.7
imbatore	7.4	6.7	1.9	4.6	4.0	0.9	4.5	4.9	5.0	9.5	11.6	13.3
ruchirapalli	12.7	12.7	11.7	2.6	9.8	0.6	11.6	9.7	8.9	-	4.6	5.3
anjavur	0.2	0.1	0.1	0.6	0.1	0.1	2.0	1.6	0.6	3.9	7.7	13.5
ligiris	0.01	0.03	N[2]	2.9	2.8	1.4	4.8	4.4	2.1	0.5	0.5	0.6
dukottai[3]	-	-	0.5	-	-	1.7	-	-	9.2	-	-	3.4
nyakumari	0.07	0.2	-	N	N	N	N	N	N	4.0	2.7	0.7

Created in 1965 incorporating northern portion of the former composite District of Salem.

Negligible

Formed in 1973 by taking some taluks from the neighbouring districts of Thanjavur and Tiruchirapalli.

Source: Basic data from Season and Crop Reports (various years), Department of Statistics, Government of Tamil Nadu.

That irrigation has been the principal factor accounting for inter-crop substitution is borne out by the fact that although the irrigated area to gross area sown has increased over the years, the area under coarse grains has shown a decrease in most districts. Table VI indicates the inverse relationship between progress of irrigation and the proportion of area under coarse grains. In all the districts, where the percentage of gross irrigated area has increased, there has been a perceptible decline in the area under coarse grains, substantiating the tendency mentioned earlier of high value paddy being substituted for low value coarse grains with increase in irrigation facility. 6/

In contrast to coarse grains, the proportion of area under pulses has gone up in most of the districts during the last two decades (vide Table V). The increase has been significant in Thanjavur where the proportion of area nearly quadrapled between the triennium ending 1961-62 and 1981-82. In Salem, the proportion of area under pulses has declined from 13.0 per cent to 6.0 per cent between the triennium ending 1961-62 and that ending with 1971-72 due ostensibly to the bifurcation of the district. A significant decline has also been noticeable in Kanyakumari where the increase in area under non-food crops has been responsible for the development. In this district, while the gross cropped area between the triennium ending 1961-62 and that ending with 1971-72 increased by only 3.5 per cent, the proportion of area under non-food crops increased by 33.8 per cent. During the next decade, the gross cropped area showed a tendency to decline and this has aggravated the decline in the proportion of area under pulses in the district.

Table VI: Percentage of gross irrigated area to gross sown area and percentage of gross cropped area under coarse grains

District	Percentage of gross area irrigated			Percentage of gross cropped area under coarse grains		
	Triennium ending with 1961-62	Triennium ending with 1971-72	Triennium ending with 1981-82	Triennium ending with 1961-62	Triennium ending with 1971-72	Triennium ending with 1981-82
Chengalpattu	67.8	72.0	79.4	10.7	8.6	5.0
South Arcot	46.9	56.3	54.9	26.6	21.2	19.3
North Arcot	45.7	53.1	46.7	22.5	16.5	15.9
Salem	19.9	31.2	36.6	53.3	42.2	29.4
Coimbatore[1]	36.6	38.8	44.1	39.3	39.7	35.8
Tiruchirapalli	35.5	35.8	36.6	43.4	40.1	43.6
Thanjavur	78.9	74.4	74.1	2.9	2.1	0.6
Madurai	39.8	38.2	45.4	35.9	37.5	30.6
Ramanathapuram	40.9	38.6	43.7	28.4	25.1	19.4
Tirunelveli	40.4	40.7	46.6	24.8	26.9	20.5
Kanyakumari	44.5	53.8	49.4	-	Negligible	Negligible
Dharmapuri	-	16.8	22.7	-	48.1	43.5
Pudukottai	-	-	57.0	-	-	9.8

1 Average of 1959-60 and 1961-62

Source: Basic data from Season and Crop Reports (various years), Department of Statistics, Government of Tamil Nadu.

5. Listing of districts by the relative importance of the crop in the district and by the relative importance of the district in the cultivation of the crop in the State.

A measure of the importance a crop gets in a district may be represented by the formula.

$$I_{ij} = \frac{\text{the percentage share of the gross cropped area of district i which is in crop j}}{\text{the percentage share of the district in the total State gross cropped area under the crop j}}$$

Thus Iij measures the importance of the jth crop in the ith district as well as the importance of the ith district in the cultivation of the jth crop in the State. To illustrate, for the triennium ending with 1971-72, Chengalpattu had 70.9 per cent of its gross cropped area under paddy as against 35.7 per cent in the State; alternatively Chengalpattu accounted for 11.9 per cent of the area under paddy in the State while its share in total gross cropped area had been only 5.9 per cent. The measure Iij works out to 2.0. This leads to the conclusion that paddy got twice as much importance in Chengalpattu as in the State as a whole. Another interpretation is that Chengalpattu gets twice as much importance as a "normal district" (meaning thereby a district whose contribution to area under paddy in the State is exactly the same as its share in the gross cropped area in the State). This interpretation enables us to list the districts which are prominent in the cultivation of each foodgrain crop in their order for the triennium ending 1961-62, 1971-72 and for 1978-79.

The importance of the districts as measured by Iij is indicated in Table VII.

Table VII: Listing of Districts according to Iij

1960-61

District	Paddy	Cholam	Cumbu	Ragi	Other cereals	Pulses	Foodcrops other than foodgrains	Non-food crops
Chengalpattu	2.1	0.04	0.2	1.5	0.2	0.2	0.5	0.5
South Arcot	1.2	0.9	1.0	0.8	1.2	0.4	7.0	1.1
North Arcot	1.1	0.7	0.4	1.1	0.9	1.0	0.8	1.2
Salem	0.3	1.5	1.5	2.9	1.8	2.3	0.7	0.8
Coimbatore	0.4	2.1	1.1	0.9	0.6	1.7	0.8	1.3
Tiruchirapalli	0.8	1.6	1.8	0.5	1.6	0.7	1.3	0.9
Thanjavur	2.3	0.002	0.02	0.1	0.3	0.7	0.5	0.5
Madurai	0.7	2.0	0.4	0.5	1.2	0.8	1.2	1.2
Ramanathapuram	1.1	0.2	1.5	1.2	1.5	0.5	0.9	1.1
Tirunelveli	0.8	0.5	1.9	0.3	0.6	1.2	1.6	1.4
Nilgiris	0.2	0.01	0	0.6	0.6	0.1	4.1	2.8
Kanyakumari	1.6	0.01	0.01	0	0	0.7	4.6	1.4
Dharmapuri	-	-	-	-	-	-	-	-
Pudukottai								

contd....

Table VII .....

1970-71

District	Paddy	Cholam	Cumbu	Ragi	Other cereals	Pulses	Foodcrops other than foodgrains	Non-food crops
Chengalpattu	2.0	0.03	0.3	1.4	0.2	0.2	0.4	0.6
South Arcot	1.2	0.5	1.3	0.8	0.8	0.5	1.0	1.0
North Arcot	1.1	0.6	0.4	1.0	0.7	0.8	0.8	1.2
Salem	0.4	1.8	1.9	1.7	0.8	1.0	1.2	1.2
Coimbatore	0.3	2.4	1.1	1.0	0.8	1.8	0.9	1.2
Tiruchirapalli	0.8	1.7	1.9	0.5	1.5	0.7	1.4	0.9
Thanjavur	2.1	0.01	0.02	0.1	0.2	1.2	0.5	0.5
Madurai	0.6	2.1	0.7	0.4	1.6	0.8	1.3	1.2
Ramanathapuram	1.2	0.2	1.3	1.2	1.6	0.4	1.0	1.0
Tirunelveli	0.7	0.6	2.2	0.5	0.8	1.5	1.4	1.3
Nilgiris	0.2	0.03	0.1	0.7	0.8	0.1	3.1	2.8
Kanyakumari	1.4	0.02	0.02	--	-	0.4	3.6	1.5
Dharmapuri	0.3	1.2	0.5	4.7	2.3	3.1	0.7	0.7
Pudukottai	-	-	-	-	-	-	-	-

contd.....

Table VII .....

1978-79

District	Paddy	Cholam	Cumbu	Ragi	Other cereals	Pulses	Foodcrops other than foodgrains	Non-food crops
Chengalpattu	2.1	0.01	0.2	1.1	0.1	0.1	0.4	0.7
South Arcot	1.2	0.3	1.8	0.7	0.9	0.4	1.0	1.0
North Arcot	1.2	0.5	0.4	0.8	0.6	0.6	0.8	1.4
Salem	0.4	1.7	1.5	1.9	1.1	0.9	1.3	1.3
Coimbatore	0.4	2.7	0.9	1.2	0.7	1.4	1.0	1.2
Tiruchirapalli	0.7	2.0	2.5	0.2	1.7	0.7	1.4	0.6
Thanjavur	1.9	0.002	0.02	0.03	0.1	2.2	0.3	0.5
Madurai	0.7	2.2	0.7	0.3	1.4	0.9	1.2	1.1
Ramanathapuram	1.2	0.2	1.2	1.1	1.4	0.5	1.1	1.0
Tirunelveli	0.8	0.5	2.1	0.4	0.8	1.2	1.4	1.2
Nilgiris	0.2	0.01	0.01	0.5	0.6	0.1	2.4	2.9
Kanyakumari	1.2	0.001	-	0.003	-	0.4	2.7	1.2
Dharmapuri	0.3	1.3	0.4	5.1	2.6	2.1	1.0	0.8
Pudukottai	1.5	0.1	0.1	0.6	1.7	0.4	0.7	1.0

Listing of districts in the Order of the Index of Cropping Intensity:

1961-62	1971-72	1978-79
Paddy		
Thanjavur	Thanjavur	Chengalpattu
Chengalpattu	Chengalpattu	Thanjavur
Kanyakumari	Kanyakumari	Pudukottai
South Arcot	South Arcot	Kanyakumari
North Arcot	Ramanathapuram	South Arcot
Ramanathapuram	North Arcot	Ramanathapuram
		North Arcot
Cholam		
Coimbatore	Coimbatore	Coimbatore
Madurai	Madurai	Madurai
Tiruchirapalli	Salem	Tiruchirapalli
Salem	Tiruchirapalli	Salem
		Dharmapuri
Cumbu		
Tirunelveli	Tirunelveli	Tiruchirapalli
Tiruchirapalli	Tiruchirapalli	Tirunelveli
Salem	Salem	South Arcot
Ramanathapuram	Ramanathapuram	Salem
Coimbatore	South Arcot	Ramanathapuram
South Arcot	Coimbatore	

contd...

1961-62	1971-72	1978-79
Ragi		
Salem	Dharmapuri	Dharmapuri
Chengalpattu	Salem	Salem
Ramanathapuram	Chengalpattu	Coimbatore
North Arcot	North Arcot	Chengalpattu
Other Cereals		
Salem	Dharmapuri	Dharmapuri
Tiruchirapalli	Ramanathapuram	Pudukottai
Ramanathapuram	Madurai	Tiruchirapalli
Madurai	Tiruchirapalli	Ramanathapuram
South Arcot		Madurai
		Salem
Pulses		
Salem	Dharmapuri	Thanjavur
Coimbatore	Coimbatore	Dharmapuri
Tirunelveli	Tirunelveli	Coimbatore
North Arcot	Thanjavur	Tirunelveli
Non-food crops		
Nilgiris	Nilgiris	Nilgiris
Kanyakumari	Kanyakumari	North Arcot
Tirunelveli	Tirunelveli	Salem
Madurai	North Arcot	Coimbatore
North Arcot	Coimbatore	Tiruchirapalli
Ramanathapuram	Salem	Kanyakumari
South Arcot	Madurai	Madurai
	South Arcot	Pudukottai
		South Arcot

6. Impact of changes in the cropping pattern on the food grain economy

Changes in the cropping pattern have an important bearing on the food economy by influencing the acreage under foodgrains. Over the last three decades, there has taken place a slight decline in the acreage under foodgrains. This has been brought about by expansion of area under food crops other than foodgrains, primarily sugarcane. What is far more significant is the pronounced inter-crop substitution of low value coarse grains by high value paddy. While the acreage under paddy increased from 35 per cent of the gross cropped area in the triennium ending with 1961-62 to 38 per cent in 1979-80, that under coarse grains declined from 30 per cent to 23 per cent during the same period.

The expansion of irrigation has been very closely linked with this development; so also the adoption of the new technology in agriculture (the seed-fertilizer technology) which has increased the profitability of growing paddy. The changes in the consumption pattern reflected in the substitution of coarse grains by superior cereals, rice and wheat, in the diet of higher income groups both in rural and urban areas have been another factor accounting for the decline in coarse grain acreage.

The inverse relationship between progress of irrigation and acreage under coarse grains suggests that unless improvements in the resource base of coarse grain production is combined with improvements in technology, the relative profitability of coarse grain production cannot be improved. Without this step, the progressive decline in coarse grain

acreage cannot be arrested. The need for doing so arises particularly from the fact that coarse grains are a poor man's crop, in the sense that it is consumed predominently by the lower income groups.

Unlike coarse grain acreage, there has taken place a noticeable increase in the area under pulses, although they are rarely grown under irrigation. This could be explained by the sustained demand for pulses and by the possibility of growing them as an inter-crop. The increase in pulse acreage in the State has been in marked contrast to the tendency observable at the national level.

References

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4. Growth of Productivity in Indian Agriculture by Dharam Narain: Cornell University, New York 1976.

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Chapter III

Adoption of New Technology

1. The Seed-fertilizer Technology:

The adoption of the seed-fertilizer technology in the mid-sixties brought about a significant impact on the level of production and productivity of foodgrains in the State. Since the new technology characterized by the use of fertilizer-responsive high yielding varieties of seeds made more rapid progress in rice, this chapter is devoted to an analysis of the adoption of seed-fertilizer technology in rice and its impact on production and productivity.

Although the expansion in rice production in the State in the fifties has been impressive, it was brought about more by expansion in area than by increase in yield. Of the increase in production of rice from 19.3 lakh tons in 1950-51 to 35.6 lakh tons in 1960-61, the area effect accounted for as much as 57.6 per cent. A breakthrough in yield could take place only with the adoption of the seed-fertilizer technology from 1966-67. Although improved traditional varieties had been developed such as ADT 27 and CO 29, they were longstrawed, limited in their response to fertilizer and liable to lodge. Short-strawed, fertilizer-responsive rice varieties such as IR5, IR8, IR20 and IR22 began to be introduced from 1966-67.

Whereas the yield of rice in 1959-60 was only 1050 kg. per ha. and production 33.3 lakhs tons, the breakthrough came in 1970-71 when the yield touched 1899 kg. per ha. and production 46.2 lakh tons. In 1978-79, the yield exceeded 2.0 tons per ha. and production 55.6 lakh tons (vide Annexure: Table I). The breakthrough in productivity and production

of rice has been deemed to be a "rice revolution". Thus it has been "claimed that if wheat revolution has been going on in Punjab, rice revolution is going on in Tamil Nadu".[1] How far is this claim justified?

2. The Sources of growth

a) Progressive increase in coverage of paddy area by high-yielding varieties:

There has been a progressive increase in coverage of paddy area by HYV. This can be seen from the Table below:

Table I: Paddy area covered by high yielding varieties (Lakh ha.)

Year	Area covered by HYV	Proportion to total paddy area (per cent)
1966-67	1.90	7.1
1970-71	17.98	68.3
1979-80	23.59	81.2
1980-81	19.33	84.1
1981-82	22.54	89.87
1982-83	15.79	79.99
1983-84	22.82	94.63
1984-85	23.05	93.97

Source: Department of Agriculture: Government of Tamil Nadu.

Both 1980-81 and 1981-82 witnessed a decline in total paddy acreage from the level of 1979-80 (vide Annexure: Table I) due to adverse weather conditions. Thus though the area covered by HYV shows a reduction, its proportion to total paddy acreage is higher as the proportion refers to a smaller total acreage.

It may be mentioned that there is a difference between official and survey estimates of rates of adoption of HYV's, the former tending to be higher than the latter as it is based on quantity of seeds distributed by official sources, the average seed rate per ha and a factor to account for "natural spread".[2] Even allowing for this discrepancy, there has been a substantial increase since 1966-67 in the coverage of paddy area by HYV's, judging by the 160 per cent increase in productivity between 1966-67 and 1981-82.

b) Expansion of controlled irrigation:

It was the very rapid expansion of electric pumpsets during the sixties and seventies, which gave an independent control of assured water, that led to rapid adoption of the new seed varieties. The number of pumpsets energised from 1967-68 is indicated below:

Table II: Energisation of pumpsets

Year	Number of pumpsets energised (000)
1967-68	344
1968-69	410
1969-70	471
1970-71	530
1971-72	594
1972-73	649
1973-74	681
1974-75	707
1975-76	743
1976-77	774
1977-78	810
1978-79	841
1979-80	887
1980-81	919

(Source: Various issues of Tamil Nadu: An Economic Appraisal, Between 1967-68 and 1980-81 the number of pumpsets energised increased more than two and a half times).

"The pumpset revolution" enabled the new fertilizer-responsive seeds to progressively cover an increasing proportion of paddy area. It may be mentioned that Tamil Nadu leads any other State in the country in the number of pumpsets energised.

c) Increasing application of fertilizers:

The progressive increase in coverage of paddy area by HYV necessitated larger consumption of fertilizers in view of the marked responsiveness of the new seeds to fertilizer application. Although data on amount of fertilizers applied to foodgrains are not available separately, 75 per cent of fertilizer consumption is normally ascribed to foodgrains, paddy accounting for bulk of the consumption. The progress in the consumption of fertilizers is indicated below:

Table III: Consumption of fertilizers (NPK)
(in lakh tons)

Year	Total consumption	Fertilizers applied to foodgrains
1968-69	1.8	1.4
1971-72	3.5	2.6
1979-80	5.4	4.1
1981-82	5.1	3.8

The seed-fertilizer technology is a "land saving technology" in the sense that fertilizer-responsive high-yielding varieties facilitate substitution of fertilizers for land in crop production.

3. Contribution of the factors to rice output:

Since the factors contributing to rice output, HYV, irrigation, and fertilizers are complementary, it is difficult to assess their individual contribution. In view of multi-collinearity among them, rice output has been regressed on a set of inputs, fertilizers and rainfall relative for the period 1966-67 to 1981-82.[3] Fertilizers play a crucial role in view, as mentioned earlier, of the responsiveness of the new seeds to fertilizer use. Rainfall relative represents the deviation of actual rainfall from the normal rainfall (normal represents the average for 50 years ending 1960 which corresponds to 942.8 mm). This variable is equally important as even the paddy areas covered by irrigation system is dependent on storage water which is dependent on rainfall. The input data are given in Annexure: Table III.

Output of paddy (in physical units) is taken as dependent variable (Y) and the independent variables are fertilizers (X1) and rainfall relative (X2). The resulting equation is indicated below:

$$Y = 1796+5.52X1+16.65X2$$

The regression coefficient $R^2 = 0.65$ is significant at 5% level. Thus 65 per cent of variations in rice output could be explained in terms of the two variables, fertilizer and rainfall relative.

4. Impact on production & productivity

The adoption of the seed fertilizer technology resulted in a substantial increase in rice production. The impact of

the new technology can be seen in its proper perspective if we compare the rate of growth of production before and after the adoption of seed-fertilizer technology. During the ten years from 1955-56 to 1965-66 (years preceeding the adoption of the seed-fertilizer technology), the production of rice rose from 30.0 lakh tons to 35.2 lakh tons representing a compound growth rate of 1.6 per cent per annum. Between 1966-67 to 1979-80, the period which witnessed the wider adoption of new technology, the production of rice increased from 37.9 lakh tons to 58.0 lakh tons representing a compound growth rate of 3.3 per cent per annum. The production of rice has been declining since 1979-80 due to adverse weather conditions except in 1981-82 when the production touched the level of 56.8 lakh tons, but still below the level attained in 1979-80 (vide Annexure: Table I). The following Table indicates the rate of growth in rice production in the State between 1966-67 and 1979-80.

Table IV

Production in 1966-67 (000 tons)	Production in 1979-80 (000 tons)	Compound rate of growth (in percent per annum)
379	5799	3.3

What needs to be stressed is that in contrast to the fifties and the early sixties, almost the whole of the increase in production since the mid-sixties can be attributed to increase in productivity. The increase in productivity is indicated in the Table below:

Table V

Year	Productivity (yield) of rice (in kg.per ha)
1955-56	1139
1965-66	1408
1970-71	1899
1978-79	2017
1981-82	2265

Thus between 1965-66 and 1981-82, productivity increased by 61 per cent. It may be mentioned that in only two States, Haryana and Punjab, has the yield rate for rice exceeded that of Tamil Nadu; 2600 kg. per ha in Haryana (1981-82) and 3144 kg. per ha in Punjab (1982-83). The higher yield level in these two States has been due to availability of assured irrigation and larger consumption of fertilizers (fertilizer (NPK) consumption per ha of cropped area in 1981-82 in Punjab has been of the order of 124.0 kgs. per ha whereas in Tamil Nadu it has been of the order of only 67 kg per ha), apart from institutional factors such as larger percentage of area under ownership cultivation and consolidation of holdings.

5. Adoption of new technology at district level

In the absence of time-series data on inputs at the district level, it has been possible to trace developments in the adoption of new technology only from 1971-72. As at the State level, the sources of growth have been wider adoption of HYV, expansion of irrigation facilities and increased use of fertilizers. The following table indicates developments in these directions.

Table VI: Coverage of HYV (in per cent); per cent of irrigated area to gross sown area and fertilizer consumption in rice production (000 tons)

District	Percentage of paddy area covered by HYV[1]		% of gross irrigated area to gross sown area		Fertilizer use[2] in rice production	
	1971-72	1979-80	1971-72	1979-80	1971-72	1979-80
Chengalpattu	84.8	82.9	69.5	72.1	27.5	45.2
South Arcot	70.0	80.0	55.5	58.8	32.1	43.4
North Arcot	89.4	77.4	53.2	60.2	18.7	36.1
Salem	97.1	87.5	31.3	39.2	14.5	20.4
Dharmapuri	80.0	83.3	17.2	21.9	5.0	5.9
Coimbatore (including Periyar)	78.6	83.3	40.2	40.8	39.5	61.1
Tiruchirapalli	71.8	73.7	36.8	40.9	31.8	42.5
Pudukottai	-	75.0	-	53.4	-	10.7
Thanjavur	3.1[3]	95.2	72.6	71.0	37.1	48.6
Madurai	77.7	94.1	38.7	47.0	18.8	38.3
Ramanathapuram	78.8	60.0	40.0	43.5	10.9	14.7
Tirunelveli	86.0	73.7	41.6	47.4	18.0	24.4
Kanyakumari	61.7	60.0	54.7	50.3	4.4	3.6

Source: 1 Dept. of Agriculture, Govt. of Tamilnadu for coverage of HYV
2 Agricultural & Fertiliser Statistics: Southern Region; The Fertilizer Assn. of India. Fertilizer use in rice production taken to be 75% of total fertilizer use.
3 Insignificant area under HYV in 1971-72 has been due to the fact that improved local varieties had already been in use.

While the coverage of paddy area by HYV has been erratic in the districts due, as was mentioned earlier, to the methods adopted in official calculations, there has been a progressive increase in the proportion of gross area irrigated to gross area sown in all the districts except in Thanjavur and Kanyakumari and fertilizer consumption has been stepped up in all the districts except in Kanyakumari. That fertilizer use in rice production has been the highest in Coimbatore (including Periyar) in 1979-80 (higher than even in Thanjavur) raises doubts as to whether the entire quantity has been used in rice production or part of it diverted to the more remunerative crop namely sugarcane. This indicates that the conventional estimate of 75 per cent of total fertilizer use as being accountable for by foodgrains may be an over-estimate if more remunerative crops than rice are being grown. The need for supplementing official estimates by survey estimate hardly needs any emphasis.

6. Impact on production:

The impact of the new technology on output can be assessed by the increase in production and productivity between 1966-67 (when the new technology came to be introduced) and 1979-80 (by which time the new technology has been widely adopted). Table below indicates the compound rate of growth in output between 1966-67 and 1979-80.

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Table VII: Compound growth rate of rice production between 1966-67 & 1979-80

District	Production in 1966-67 (000tons)	Production in 79-80 (000tons)	Productivity in 1966-67 (kg.per ha)	Productivity in 79-80 (kg.per ha)	Growth rate of production (compound rate in percent per annum
Chengalpattu	400.2	626.1	1170	1772	3.5
South Arcot	475.6	729.2	1520	2069	3.3
North Arcot	397.6	678.6	1320	2208	4.2
Salem	156.7	158.5	1809	2027	0.1
Dharmapuri	72.1	116.5	1398	1908	3.7
Coimbatore (including Periyar)	167.6	301.9	1845	2427	4.6
Tiruchirapalli	384.7	325.1	1567	1735	-1.3
Thanjavur	877.5	1298.7	1443	2090	3.1
Madurai	250.1	434.2	1559	2536	4.3
Ramanathapuram	299.7	398.0	1093	1312	2.2
Tirunelveli	211.2	394.8	1365	2307	4.9
Kanyakumari	94.7	126.2	1689	2525	2.2

(Level of production and productivity from 1959-60 is given in Annexure Table II)

Districts with growth rate in output of 4.0 per cent and above may be regarded as high growth districts; between 2.0 and 4.0 per cent as medium growth districts and below 2.0 per cent as low growth districts. It will be noticed from Table VII that the number of high growth districts in the State has been 4; medium growth districts 6; and low growth districts 2. Medium growth rate in Dharmapuri is accounted for by the low base. Districts exceeding the State level growth rate (3.3 per cent) have been 6 (Chengalpattu, North Arcot, Dharmapuri, Coimbatore including Periyar, Madurai and Tirunelveli). Barring Dharmapuri, these are the districts where the irrigated acreage and fertilizer usage have been high.

7. Contribution of component elements to growth in rice output at State level

The increase in rice output between 1966-67 and 1979-80 can be decomposed into (a) changes in area, (b) changes in per ha yields, (c) changes in cropping pattern, and (d) interaction between yields and cropping pattern.[5/] The following table indicates the proportion of each of these components in additional output:

Table VIII: Relative contribution (in per cent) of component elements to growth of rice output between 1966-67 and 1979-80.

	Percent increase attributed to	
Area	2.17	(0.07)
Yield	95.92	(3.16)
Cropping pattern	1.38	(0.05)
Interaction	0.53	(0.02)
	100	(3.3)

The figures within brackets refer to contribution of each of the elements in terms of percentage points in the overall growth rate.

Thus, of the 3.3 per cent compound rate of growth of rice output between 1966-67 and 1979-80, about 2.7 per cent (or 0.07 percentage point) can be attributed to area growth; 95.92 per cent (or 3.16 percentage points) to productivity increase; 1.38 per cent (or 0.05 percentage points) to cropping pattern and 0.53 percent (or 0.02 percentage points) to interaction between productivity and crop pattern changes.

The decomposition of additional output into the contributions of the four elements underlines what has been stressed earlier, namely that the productivity effect has been of prime importance in the growth of production between 1966-67 and 1979-80 (the period during which the seed-fertilizer technology made rapid strides).

8. Has the adoption of the new technology reached a plateau?

From the mid seventies, the rate of growth of rice output has been slowing down in the State. Thus between 1975-76 and 1981-82, the rate of growth in rice output has been of the order of only 1.5 per cent per annum (compound growth rate). Whereas the rate of growth in productivity (yield) during the period has been of the order of 24 per cent in Andhra Pradesh, 20 per cent in Haryana, 16 per cent in Punjab, it was only 12 per cent in Tamil Nadu. This poses the question whether the sources of growth are now imposing a limit to the level of performance attainable through technological change? Another related question is whether the institutional structure has been an impediment to faster growth. This applies particularly to the small holder in rice production.

9. Limitations imposed by sources of growth

There are grounds to believe that the main sources of growth are imposing a limit to a higher level of performance attainable by the new technology. It has been said that "the secret of food is water; where there is enough water, the use of high yielding varieties with fertilisers and pesticides banishes the food problem".[6] In Tamil Nadu, the percentage of gross area irrigated to gross area sown has remained fairly constant from 1960-61 at 44-46 per cent. It was only in 1978-79 that it increased to 49.7 per cent. According to Irrigation Commission Report (1972), Tamil Nadu has almost utilised (94 per cent) through various irrigation works the surface water irrigation potential. Infact, it is one of the best irrigated States after Punjab. Ground water development has been most intensive in the State but the proliferation of wells has resulted in a progressive lowering of water table in many tracts. Except in Thanjavur and Kanyakumari districts, groundwater is available only in limited areas for further exploitation. Thus "the percentage area of land that can be provided with assured supplies of water imposes a limit to the rates of growth that can be attained by technological change. In a country like India that has had a long tradition of irrigation, and where past investments have exploited large part of the more easily available water resources, not only is the scope for further extension more limited than in some other countries but it is much more costly. Moreover, since the area with assured supplies of water usually already have higher productivity than elsewhere, the rates of growth that can be achieved are generally lower than one might be tempted to assume as feasible from the recorded rates of growth in which irrigation has been newly provided.[7] Tamil Nadu is in this predicament. This

limit to faster growth can, to some extent, be counteracted by agreement among the riparian States on the sharing of Cauvery waters. Till such time, irrigation as a source of growth will continue to impose a limit to the level of performance attainable by the new technology.

Another factor determining the rate of growth of output is the scope for further expansion of coverage of new varieties. It was pointed out earlier that 93 per cent of paddy area has already been covered by HYV's. But a disaggregation of the paddy area into I crop, II crop and III crop reveals that whereas the area under I crop (Samba, grown between July and February) constitutes 78 per cent of total area under paddy (1981-82), the area covered by HYV constitutes only 64 per cent.[8] The reasons for this are mainly two fold. In the first place, erratic rainfall during I crop season makes water management difficult. Secondly, being a wet season, there is greater humidity and greater likelihood of pest attack. Thus greater coverage of area under I season paddy by HYV, depends on greater attention being paid to proper irrigation and drainage, and integrated plant protection measures.

Another limitation to faster growth is the rise in cost of energy intensive inputs such as fertilisers and pesticides due to the marked increase in the price of commercial energy from 1973. A study of the impact of high yielding varieties programme in South Arcot District[9] reveals that of the total cost of cultivation per hectare of paddy, as much as 35 per cent is accounted for by fertilisers. Although the increase in costs of inputs is taken into account in the fixation of procurement price by the Committee on Agricultural Costs and Prices, the small farmer is at a

disadvantage unless the inputs are made available to him at the right time, in adequate quantities, and at prices which he can afford.

Among the several inputs which are crucial for output growth, fertilizers have been acknowledged to be the most dominant. The analysis of the data for the period 1966-67 and 1979-80 shows that rice output and fertiliser use have a high degree of correlation. However, although fertiliser consumption in rice production had doubled between 1975-76 and 1981-82 (from 212 thousand tons in 1975-76 to 440 thousand tons in 1981-82), productivity increase has been marginal (increasing from 2029 kg. per hectare in 1975-76 to 2265 kg. per hectare in 1981-82), probably indicating a decline in fertiliser-use efficiency. It also indicates that for breaking the 2 ton barrier of per hectare productivity at the State level, fertiliser by itself cannot do the trick. Fertiliser has to be combined with other associated inputs, besides removing the institutional impediments, if a higher growth rate is to be attained.

If the momentum of the seed-fertiliser technology is to be maintained, efforts should also be made to remove the additional constraints to permit a larger number of farmers to achieve the potential of the new technology. Although the new technology is "scale neutral", it is not so in respect of accessibility to production requisites. Credit is a crucial element in the wider adoption of the new technology as the purchased inputs are costlier than traditional inputs and as exploitation of water resources especially groundwater depends to a significant degree on provision of credit to small farmers. An evaluation of Drought Prone Area Programme (DPAP), Integrated Rural Development Programme (IRDP) and selected programmes,

conducted in two districts of the State, comes to the conclusion that the major bottleneck in exploiting groundwater potential is credit.[10] The evaluation report points out that "the ability of the better off farmers to preempt the use of ground water resources underlines the need for expeditious credit assistance to small farmers through ARDC or otherwise, for putting up wells in areas where additional potential is established". Although the small holders (having operational holdings below 2 hectares) account for only 38.5 per cent of gross cropped area, 78 per cent of their cropped area are under foodgrains. Increasing the productivity of the small farmers can have a significant impact on rice production and often can be achieved with a lower share of purchased inputs as compared to larger farms.

Thus in view of the limited scope for increasing the area under cultivation except through multiple cropping and in the absence of any agreement between neighbouring States on the sharing of river waters, the main plank in the strategy for achieving a faster rate of rice production in the State would have to be more efficient use of existing irrigation facilities; progressive coverage of high yielding strains especially during the I crop season; further stepping up of the consumption of fertilisers per hectare; and increasing the productivity of the small farmers through removing the institutional impediments for wider adoption of new technology. It may be mentioned that in Punjab where the impact of the new technology has been the greatest, removal of institutional impediments largely preceeded the introduction of high-yielding varieties.

ANNEXURE

Table: I Area, Production & Productivity of Rice in the State

Area= 000 ha
Production: 000 tons
Productivity: kg.per ha.

Year	Area	Production	Productivity
1959-60	2315	3333	1440
1960-61	2518	3559	1413
1961-62	2538	3907	1539
1962-63	2666	4024	1509
1963-64	2619	3876	1480
1964-65	2626	4036	1537
1965-66	2502	3524	1408
1966-67	2689	3791	1410
1967-68	2660	3846	1446
1968-69	2363	3550	1502
1969-70	2518	4012	1593
1970-71	2636	5007	1889
1971-72	2690	5302	1971
1972-73	2851	5569	1953
1973-74	2704	5558	2055
1974-75	2238	3575	1597
1975-76	2564	5203	2029
1976-77	2284	4215	1845
1977-78	2782	5705	2050
1978-79	2756	5559	2017
1979-80	2906	5799	1996
1980-81	2299	4279	1861
1981-82	2508	5681	2265
1982-83	1974	3642	1845
1983-84	2420	4633	1914
1984-85	2520	5394	2140

Source: Season and Crop Reports (Various Issues) and Tamil Nadu - An Economic Appraisal (Various Issues); Government of Tamil Nadu.

Table: II District wise, Area, Production and Productivity of Rice

Area: 000 ha
Production: 000 tons
Productivity: Kg per ha

District	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Chengalpattu											
Area	344	332	323	335	347	339	338	342	342	251	311
Production	406	360	405	441	428	403	429	400	429	232	505
Productivity	1182	1085	1255	1317	1233	1188	1270	1170	1254	925	1624
South Arcot											
Area	242	280	288	299	304	305	299	313	319	285	304
Production	360	416	466	430	432	480	423	476	560	496	511
Productivity	1487	1486	1620	1436	1423	1574	1416	1520	1754	1741	1679
North Arcot											
Area	190	252	259	279	293	305	275	301	279	170	251
Production	277	344	387	402	422	480	384	398	329	208	387
Productivity	1460	1367	402	1441	1439	1570	1397	1320	1180	1223	1540
Salem											
Area	99	103	93	118	108	135	68	87	84	69	64
Production	177	185	169	205	189	246	109	157	145	119	113
Productivity	1799	1790	1805	1731	1759	1822	1802	1809	1736	1737	1762

contd...

Table: II (contd)

District	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dharmapuri											
Area	-	-	-	-	-	-	37	52	49	42	46
Production	-	-	-	-	-	-	65	72	66	46	80
Productivity	-	-	-	-	-	-	1762	1398	1338	1105	1741
Coimbatore											
Area	100	110	120	128	105	112	67	91	95	89	94
Production	181	189	223	258	172	205	138	168	189	209	228
Productivity	1803	1720	1865	2015	1639	1823	2048	1845	1992	2344	2424
Tiruchirapalli											
Area	195	209	226	239	225	235	214	247	223	218	219
Production	257	308	320	343	327	349	298	385	324	365	324
Productivity	1320	1472	1413	1434	1457	1483	1397	1557	1450	1671	1475
Pudukottai											
Area	-	-	-	-	-	-	-	-	-	-	-
Production	-	-	-	-	-	-	-	-	-	-	-
Productivity	-	-	-	-	-	-	-	-	-	-	-
Thanjavur											
Area	590	598	598	611	604	602	609	608	634	628	639
Production	886	901	1016	926	894	1040	911	877	920	1121	1028
Productivity	1501	1507	1700	1516	1479	1729	1495	1443	1450	1786	1613

contd...

Table : II (contd)

District	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Madurai											
Area	150	162	154	163	151	155	148	161	161	147	129
Production	246	257	278	308	271	269	234	250	243	212	215
Productivity	1649	1585	1806	1891	1799	1734	1585	1557	1511	1447	1675
Ramanathapuram											
Area	201	234	228	264	251	240	257	274	270	264	264
Production	175	192	185	277	249	212	249	300	288	181	248
Productivity	869	821	811	1048	992	882	968	1093	1066	687	937
Tirunelveli											
Area	145	173	182	167	169	136	139	155	144	141	136
Production	263	296	335	306	363	194	175	211	248	239	284
Productivity	1810	1715	1838	1827	2143	1428	1265	1365	1729	1701	2083
Kanyakumari											
Area	56	62	63	57	59	57	55	56	57	57	58
Production	99	107	118	114	106	101	106	95	103	116	83
Productivity	1751	1738	1861	1988	1803	1784	1907	1689	1796	2018	1434

contd ....

le: II (contd)

trict	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
ngalpattu												
rea	329	327	326	305	254	343	358	369	367	353	267	286
roduction	579	492	565	664	414	750	754	745	618	626	434	514
roductivity	1760	1503	1730	2181	1632	2190	2106	2019	1685	1772	1626	1798
th Arcot												
rea	324	331	330	321	260	293	291	317	332	353	229	267
roduction	692	713	758	836	522	693	659	815	686	729	427	688
roductivity	2133	2154	2299	2603	2005	2362	2265	2568	2069	2069	1865	2580
th Arcot												
rea	294	274	290	269	233	241	276	316	295	307	136	167
roduction	639	566	553	500	404	511	572	737	642	679	250	360
roductivity	2143	2064	1906	1860	1729	2116	2073	2335	2179	2208	1884	2161
em												
rea	73	70	91	77	46	63	33	63	71	78	49	76
roduction	159	149	194	147	102	153	66	139	148	158	104	193
roductivity	2184	2143	2145	1906	2223	2441	1763	2195	2039	2027	2116	2526

contd...

able: II (contd)

istrict	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
harmapuri												
rea	51	51	57	53	46	50	33	50	54	61	37	47
roduction	108	95	112	97	87	86	55	97	97	116	65	90
roductivity	2111	1869	1960	1817	1882	1708	1657	1958	1799	1906	1743	1927
oimbatore												
rea	98	103	134	98	95	126	54	118	113	127	115	115
roduction	303	251	308	213	239	303	138	267	252	211	294	296
roductivity	3105	2427	2297	2180	2522	2407	2581	2254	2229	2427	2557	2574
iruchirapalli												
rea	227	235	191	180	143	160	123	160	181	187	145	162
roduction	376	472	349	345	227	323	252	367	415	325	274	345
roductivity	1656	2009	1827	1918	1594	2016	2051	2289	2291	1735	1883	2135
udukottai												
rea	-	-	-	-	73	111	102	120	120	121	82	111
roduction	-	-	-	-	25	178	196	224	228	215	68	241
roductivity	-	-	-	-	338	1600	1925	1857	1896	1771	829	2176
hanjavur												
rea	650	656	623	621	597	625	527	592	597	621	626	623
roduction	1067	1342	1292	1229	936	1223	818	936	1239	1299	1393	1505
roductivity	1643	2046	2074	1979	1568	1956	1553	1581	2074	2090	2224	2416

contd ...

Table: II (contd)

District	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
Madurai												
Area	146	149	169	162	130	146	99	164	159	171	149	160
Production	365	336	375	365	197	362	170	439	392	434	383	449
Productivity	2502	2262	2232	2247	1514	2474	1725	2684	2468	2536	2572	2799
Ramanathapuram												
Area	255	278	297	289	180	236	235	293	269	303	261	308
Production	274	334	371	383	56	272	217	365	334	398	117	549
Productivity	1075	1200	1250	1326	311	1154	927	1248	1241	1312	448	1781
Tirunelveli												
Area	127	151	161	159	125	112	106	168	149	171	156	135
Production	339	395	349	419	251	228	260	452	403	395	370	331
Productivity	2670	2625	2172	2633	2018	2030	2449	2690	2703	2307	2365	2449
Kanyakumari												
Area	59	60	62	54	53	53	45	49	46	50	44	48
Production	110	152	137	114	106	116	52	115	99	126	95	114
Productivity	1884	2455	2224	2094	2016	2189	1174	2339	2136	2525	2181	2373

Source: Same as for Table I.

Table: III Input Data for Rice in the State

Area under HYV: Lakh Hectares
Fertiliser : 000 tons
Rainfall Relative: Percentage of Normal (Normal rainfall=945.7 mm)

Year	Area under HYV	Fertiliser use (NPK)	Rainfall Relative
1966-67	-	121	122
1967-68	-	116	101
1968-69	-	134	69
1969-70	11.42	150	110
1970-71	18.19	222	102
1971-72	22.18	260	91
1972-73	21.80	211	105
1973-74	21.20	253	89
1974-75	18.61	183	63
1975-76	21.69	212	91
1976-77	20.09	224	100
1977-78	24.37	347	119
1978-79	23.68	363	101
1979-80	23.59	404	116
1980-81	19.33	359	71
1981-82	21.81	440	101

Source: Records of Agriculture Department, Government of Tamil Nadu.

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CHAPTER IV

The Role of Coarse Cereals

1. Inadequate attention to coarse cereals

Coarse cereals have not received the attention that they deserve considering that they occupy 40 per cent of the cereal area in the country and account for 25 per cent of total cereal production. This stems from a number of factors. To begin with, coarse cereals constitute a composite commodity consisting of jowar (sorghum); bajra (pearl millet); maize; ragi (finger millet); and small millets (korra, varagu and samai being the most important). The production of coarse cereals being concentrated in particular regions of the country, their development is more of a regional than of national interest. The above two factors may explain why no separate targets of area and output for each of the coarse cereals have been set in the Seventh Five Year Plan 1985-90.

Since in the production of coarse cereals, the marginal and small farmers play an important role (according to the All India Report on Agricultural Census, 1970-71, of the total area of operational holdings under coarse cereals, 39 per cent are accounted for by the holdings of marginal and small farmers) and since coarse cereals are consumed predominantly by the lower income groups in rural and urban areas, coarse cereals tend to be regarded as a "poor relation" to fine cereals. Government policies in respect of procurement and distribution have reinforced this tendency. Further, as the coarse cereals are grown in low rainfall or dry land areas[1/] (at the all-India level, only 4.2 per cent of jowar area, 3.7 per cent of bajra area, and

15.5 per cent of maize area were irrigated in 1978-79), they did not, until recently, receive that much attention in research and development as the irrigated crops have received.

It is now being recognized that coarse cereals should not be allowed to remain neglected since the conventional high potential areas in the country cannot by themselves meet the growing demand for food. Moreover, since the production environment of coarse grains is characterized by risks and as they are low value crops, measures for reducing their instability of production and for increasing productivity have begun to claim greater attention in research programmes than before. It was only since 1970 with the establishment of all-India Coordinated Research Project on Dryland Agriculture, that attention came to be devoted to improved technology for the drylands. Twenty three research centres have been established since 1970, of which one is located at Koilpatti in Tirunelveli district of Tamil Nadu.

There are, however, both supply and demand constraints to development. The supply constrains are environmental, technological and institutional. The demand constraint stems from the low income elasticity of demand, especially of consumer demand. In the development context, there is a choice of development strategy: should technological development be resource-oriented or crop-oriented? Can demand constraint be overcome by developing alternative sources of demand such as feed use and industrial use if human demand tends to sag?

2. Relative position of Tamil Nadu in area and production of coarse cereals

Table:1 indicates the percentage share of States in all-India area and production of coarse cereals (1981-82 to 1983-84 average). What is striking is the regional concentration of production. Almost 78 per cent of production of jowar is accounted for by four States; Maharashtra (40.9 per cent); Karnataka (15.2 per cent); Andhra Pradesh (11.3 per cent); and Madhya Pradesh (10.6 per cent). Similarly, 73 per cent of bajra production is accounted for by four States; Rajasthan (25.4 per cent); Gujarat (23.3 per cent); Maharashtra (11.7 per cent); and Uttar Pradesh (12.5 per cent). Maize production is also concentrated in a few States; Uttar Pradeh (13.9 per cent); Bihar (12.4 per cent); Rajasthan (12.4 per cent); and Madhya Pradesh (12.6 per cent). About 87 per cent of the production of ragi is accounted for by five States; Karnataka (48.2 per cent); Tamil Nadu (12.2 per cent); Andhra Pradesh (9.5 per cent); Orissa (8.9 per cent); and Maharashtra (8.4 per cent). The major small millets producing States have been Madhya Pradesh (22.0 per cent); Andhra Pradesh (16.1 per cent); Tamil Nadu (14.3 per cent); Uttar Pradesh (13.1 per cent) and Karnataka (9.0 per cent). It will be seen that Tamil Nadu stands second in the production of ragi, next to Karnataka and third in the production of small millets, next to Madhya Pradesh and Andhra Pradesh. In the all-India production of other coarse cereals, the contribution of Tamil Nadu has been relatively insignificant.

Table: 1 Percentage share of States in all-India Area and Production of Coarse Cereals[1/]
(1981-82 to 1983-84 Average)

State	Jowar	Bajra	Maize	Ragi	Small millets
	(1)	(2)	(3)	(4)	(5)
Andhra Pradesh					
Area	12.7	4.4	5.7	9.8	14.3
Production	11.3	5.8	8.8	9.5	16.1
Assam					
Area	-	-	0.3	-	-
Production	-	-	0.2	-	-
Bihar					
Area	0.04	-	15.6	6.0	3.7
Production	0.04	-	12.4	3.3	3.3
Gujarat					
Area	5.8	12.3	5.3	1.8	3.5
Production	4.7	23.3	5.5	1.7	5.3
Haryana					
Area	0.8	7.2	1.1	-	-
Production	0.2	8.5	1.0	-	-
Himachal Pradesh					
Area	-	-	5.0	-	0.6
Production	-	-	6.8	-	0.6
Jammu & Kashmir					
Area	-	-	4.8	-	0.4
Production	-	-	5.4	-	0.6
Karnataka					
Area	13.2	5.2	2.8	43.6	9.9
Production	15.2	4.5	5.8	48.2	9.0
Madhya Pradesh					
Area	13.0	1.5	13.6	0.8	39.4
Production	10.6	1.8	12.6	0.2	22.0

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State	Jowar (1)	Bajra (2)	Maize (3)	Ragi (4)	Small Millets (5)
Maharashtra					
Area	40.1	14.3	1.4	8.9	5.2
Production	40.9	11.7	1.8	8.4	5.9
Orissa					
Area	0.2	0.07	2.8	11.6	4.5
Production	0.2	0.10	2.4	8.9	3.0
Punjab					
Area	-	0.4	5.3	-	-
Production	-	2.7	8.0	-	-
Rajasthan					
Area	5.9	42.7	15.4	-	1.3
Production	4.3	25.4	12.4	-	0.8
Tamil Nadu					
Area	4.1	2.8	0.4	9.0	6.6
Production	4.2	5.3	0.8	12.2	14.3
Uttar Pradesh					
Area	3.9	8.6	19.5	6.7	8.6
Production	4.4	12.5	13.9	6.4	13.1
West Bengal					
Area	-	-	0.9	0.6	0.2
Production	-	-	0.9	0.3	0.4

1. States with insignificant area and production have been omitted.

Source: Bulletin on Food Statistics, Ministry of Agriculture, Government of India.

3. Area under coarse cereals by size distribution of holdings

According to the all-India Report on Agricultural Census, 1970-71, of the total area of operational holdings under coarse cereals in Tamil Nadu, 36 per cent is accounted for by marginal and small farmers. As a proportion of gross cropped area of this group of farmers, the area under coarse cereals constitutes even less, about 24 per cent. Thus it is the medium and large operational holdings (above 2 ha.) which account for the bulk of the area under coarse cereals. This development may be ascribed to the fact that farms under coarse cereals are predominantly dry and are of low productivity.

4. Shift in acreage from coarse cereals

In the triennium ending with 1961-62, coarse cereals constituted 47 per cent of the total area under cereals in the State (vide Annexure Table I). This declined to 43 per cent in the triennium ending with 1971-72 and to 39 per cent in the triennium ending with 1979-80. In the triennium ending with 1982-83, the proportion has remained constant.

In Chapter II (Changes in the cropping pattern within foodgrains), the causal factors accounting for this development have been dealt with; the most important being the shift in area from low value coarse grains to high value paddy with expansion of irrigation and the higher profitability from growing paddy particularly after the adoption of the seed-fertilizer technology.

The shift in acreage from coarse cereals has also been taking place in rainfed areas due to higher profitability of alternate crops. Thus the farm management

study of Increasing Groundnut Production in North and South Arcot Districts of Tamil Nadu for the year 1981-82 2/ reveals that the net income based on paid out cost for bajra and jowar which are substitutes for groundnut in rainfed areas was only Rs.284.0 and Rs.465.0 respectively compared to Rs.666.0 from groundnut. The tendency, therefore, under favourable monsoon conditions, is to put more area under groundnut and less under bajra and jowar.

The shift in acreage from coarse cereals has also been reinforced by changes in the consumption pattern which have also been dealt with in Chapter II and more elaborately in Chapter VII. In general, it may be said that the consumption of coarse cereals in the urban areas of the State has declined over the years. The magnitude of the declines has been dealt with in Chapter VII.

The impact of the above factors on acreage under coarse cereals may be seen in the following Table:

Table II: Area under coarse cereals in the State for triennium ending with 1961-62, 1971-72, 1979-80 and 1982-83

Crop	Triennium ending 1961-62	Triennium ending 1971-72	Triennium ending 1979-80	Triennium ending 1982-83	Percentage change from 1961-62 to 1971-72	Percentage change from 1971-72 to 1979-80	Percentage change from 1979-80 to 1982-83
Jowar	771	747	723	656	3.1	3.2	9.3
Bajra	499	469	405	320	6.0	13.6	21.0
Ragi	356	294	274	195	17.4	6.8	28.8
Small millets	537	470	418	295	12.5	11.1	29.4

The sharper decline in acreage from 1979-80 to 1982-83 has been due in the main to less than normal rainfall in the State in 1980-81 (the rainfall relative being 71) and in 1982-83 (the rainfall relative being 69).

There has also been a decline in area irrigated under coarse cereals in 1980-81, 1981-82 and 1983-84 compared to 1979-80 which is indicated in Table III:

Table III:Gross area irrigated under coarse cereals

(000 hectares)

Crop	1979-80	1980-81	1981-82	1982-83
Jowar	116	96	95	71
Bajra	72	57	49	32
Ragi	98	89	73	62
Small millets	10	6	4	2

Source: Tamil Nadu - An Economic Appraisal 1984-85, Evaluation and Applied Research Department, Government of Tamil Nadu .

6. The adoption of new technology:

The progress in the adoption of the new technology in coarse cereals has been less rapid and less marked than in respect of rice in view of declining irrigated area. The coarse cereals area covered by high yielding varieties is indicated below:

Table IV: Coarse Cereals Area covered by HYV

Year	Jowar area covered under HYV	Percent to total area	Bajra area covered under HYV	Percent to total area	Ragi area covered by HYV	Percent to total area
1971-72	0.17	2.4	0.96	21.4	-	-
1979-80	2.07	28.7	2.30	62.2	1.74	69.0
1981-82	2.18	31.0	2.61	77.6	-	-

It is only in respect of bajra and ragi that there has been a marked increase in the coverage of area under HYV. This is explained by the higher percentage of area irrigated under these two crops as compared to that under jowar (vide Chapter II).

The adoption of HYV in rainfed areas is greatly restricted by the amount of rainfall at critical stages. The local varieties would not fail as the new varieties in the event of late rainfall during the tillering stage. Moreover, the new varieties are more susceptible to pests and diseases (applicable equally to irrigated areas) than the traditional varieties.

7. Impact on production and productivity

The increase in coverage of area by HYV is reflected in increase in production and productivity since 1970-71. Jowar production increased from 543 thousand tons in 1970-71 to 653 thousand tons in 1979-80 representing a compound growth rate of 2.4 per cent per annum. During the same period, bajra production increased from 312 thousand tons

to 329 thousand tons representing a compound growth rate of 2.7 per cent per annum and ragi production from 334 thousand tons to 357 thousand tons representing a compound growth rate of 2.7 per cent per annum. These increases have taken place despite the fall in acreage under these crops. The following table sums up the position:

Table V: Production (P) in 000 tons; productivity (Y) in Kg. per hectare; and compound rate of growth in per cent per annum (R).

Year	Jowar		Bajra		Ragi		Rate of growth (R)					
	P	Y	P	Y	P	Y	Jowar		Bajra		Ragi	
							P	Y	P	Y	P	Y
1970-71	543	732	312	657	334	1180						
1979-80	653	906	329	889	357	1417	2.4	2.8	2.7	4.4	2.7	3.2

The negative growth rate in production in the sixties has been transformed into a positive one in the seventies. It may be mentioned that at the all-India level, Tamil Nadu stands second (next to Karnataka) in productivity of jowar, third in respect of bajra (next to Gujarat and Punjab), while it leads in respect of ragi.

8. Disaggregation to district level

The concentration of area under and production of the constituents of coarse cereals in a few districts is as much a characteristic of Tamil Nadu as of regional concentration at all-India level. Table VI indicates the percentage share of districts in area and production of coarse cereals for the triennium ending with 1961-62, that ending

with 1971-72 and that ending with 1979-80. (vide Annexure Table III for area, production and productivity at district level). Four districts (Madurai, Coimbatore, Tiruchirapalli and Dharmapuri) account for 72 per cent of jowar production; similarly 63 per cent of bajra production is concentrated in four districts (South Arcot, Tiruchirapalli, Coimbatore and Ramanathapuram); and 76 per cent of ragi production is accounted for by five districts (Dharmapuri, Salem, Coimbatore, South Arcot and North Arcot).

Jowar area has gone down in all districts except in Dharmapuri, Coimbatore, (inclusive of Periyar) and Madurai; the same tendency has been visible in respect of bajra area in all districts except South Arcot, Dharmapuri. Tiruchirapalli and Madurai. Ragi too has witnessed a decline in acreage in all districts except Dharmapuri and Coimbatore (inclusive of Periyar) inspite of the fact that the proportion of gross irrigated area to gross sown area has increased over the time span. Thus it may be concluded that when the expansion of the resource base of area under course cereals improves through increase in irrigation facility, the tendency of the farmer to replace them by high value crops has been pronounced.

Table VI: Percentage share of Districts in State Area and Production of coarse cereals for Triennium ending with 1961-62, 1971-72 and 1979-80

DISTRICT	JOWAR			BAJRA			RAGI			SMALL MILLETS		
	1961-62	1971-72	1979-80	1961-62	1971-72	1979-80	1961-62	1971-72	1979-80	KORRA 1979-80	VARAGU 1979-80	SAMAI 1979-80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chengalpattu												
Area	0.2	0.2	-	1.3	1.7	1.2	9.2	8.3	6.7	1.3	1.5	1.6
Production	0.2	0.2	-	1.2	1.8	2.3	8.1	9.3	6.5	1.6	1.3	-
South Arcot												
Area	6.2	4.9	3.2	9.8	12.3	17.8	7.3	7.4	6.9	10.8	19.0	0.4
Production	3.1	5.9	4.8	6.7	14.5	27.4	7.7	8.0	9.8	14.6	26.0	0.6
North Arcot												
Area	6.2	5.1	4.3	3.8	3.5	3.5	9.5	9.2	7.7	7.6	2.9	13.2
Production	5.5	6.2	5.7	3.3	4.5	4.5	11.3	10.3	9.2	7.6	3.0	19.8
Salem												
Area	18.9	11.6	11.6	18.7	12.0	10.0	38.1	10.9	12.5	31.8	7.1	10.8
Production	20.9	10.9	8.2	16.8	18.0	7.1	32.7	10.5	13.9	30.8	4.5	10.3
Dharmapuri												
Area	-	7.3	8.6	-	2.8	7.6	-	29.2	34.2	6.4	7.8	48.0
Production	-	7.2	10.9	-	2.6	7.0	-	19.3	28.9	4.5	4.8	42.3
Coimbatore												
Area	26.5	27.4	29.5	13.4	12.2	10.4	11.5	11.6	12.8	17.2	0.4	14.1
Production	25.55	21.5	22.0	16.5	12.4	10.4	13.8	11.7	13.8	17.1	0.4	13.0

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Table VI: (contd)

DISTRICT	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tiruchirapalli												
Area	17.3	18.5	18.1	20.4	21.3	21.8	4.1	5.0	2.0	4.5	29.5	5.1
Production	14.8	14.8	14.0	21.8	19.0	15.3	5.7	11.1	2.4	4.9	30.3	5.8
Pudukottai												
Area	-	-	0.4	-	-	0.4	-	-	1.8	-	8.7	0.7
Production	-	-	-	-	-	-	-	-	0.9	-	9.0	0.9
Thanjavur												
Area	0.2	0.2	-	0.2	0.2	-	1.2	1.0	0.2	-	-	-
Production	0.3	0.3	-	0.1	0.2	-	1.3	0.1	-	-	-	-
Madurai												
Area	18.1	18.5	19.1	4.0	2.3	6.4	4.4	3.6	2.2	12.1	7.5	22.2
Production	21.6	23.6	25.2	5.9	6.9	7.4	5.6	3.9	2.7	9.8	7.2	23.8
Ramanathapuram												
Area	1.8	1.7	1.7	12.3	11.2	10.3	9.9	10.2	9.6	-	12.7	2.5
Production	1.9	1.8	1.7	13.4	9.9	10.1	10.1	9.4	8.2	-	11.4	2.6
Tirunelveli												
Area	4.5	4.5	3.3	15.9	16.3	15.5	2.8	3.4	3.4	2.5	-	7.7
Production	6.2	6.7	6.9	14.2	17.4	7.3	3.6	3.8	3.7	2.4	-	7.4
The Nilgiris												
Area	-	-	-	-	-	-	0.4	0.5	0.4	-	-	-
Production	-	-	-	-	-	-	0.3	0.4	-	-	-	-
Kanyalumari												
Area	0.06	0.2	0.07	-	-	-	-	-	-	-	-	-
Production	-	-	-	-	-	-	-	-	-	-	-	-

1. Includes Periyar district also.

Source: Season and Crop Reports (Various Issues) Department of Statistics, Government of Tamil Nadu.

That inspite of the decline in land area, production increased between the triennium ending with 1971-72 and that ending with 1979-80 in the major coarse cereals growing areas has been due to the increase in productivity. This is evident from the yield levels attained in the major producing districts as may be seen below:

Table VII: Yield (in kg. per ha) in the major producing districts

	Triennium ending 1971-72	Triennium ending 1979-80	Percentage increase
JOWAR			
Madurai	874	1385	158
Coimbatore	722	787	109
Tiruchirapalli	577	714	124
Dharmapuri	707	1198	169
BAJRA			
South Arcot	757	1465	193
Tiruchirapalli	575	665	116
Coimbatore	654	975	149
Ramanathapuram	569	931	164
RAGI			
Dharmapuri	594	1220	205
Salem	1018	1613	158
Coimbatore	1071	1556	145
South Arcot	1147	1871	163
North Arcot	1484	1717	116

Inter-district yield differences are often explained in terms of irrigation use.[3] This would explain largely the higher yield of ragi compared to that of jowar and bajra

as ragi is grown under irrigated conditions to a much larger extent than the other coarse cereals. Even in respect of bajra, the higher yield in South Arcot is to be explained by the much larger irrigated area under the crop than in the other districts mentioned above.

A comparative study of ragi in Kolar district of Karnataka and Dharmapuri in Tamil Nadu[4] reveals that HYVs have made far less progress in Dharmapuri than in Kolar due to the problem of harvesting short duration varieties during the monsoon rains in November (the CO varieties grown in Dharmapuri are short duration varieties maturing in about 90 to 100 days), whereas the local varieties which are of longer duration skip this period. The evolving of long duration varieties may be the answer to this problem in Dharmapuri.

9. Pattern and Level of Consumption

The consumption of coarse cereals is highly localized in the sense that they are mainly consumed where they are produced. The 1961 Census of India conducted a sample survey in 1961-62 to ascertain the food habits of the people in different regions of the State. To determine the level of consumption, the State was divided into three zones - rice zone, mixed zone and millet zone. At the State level, 52 per cent of the population were estimated to be rice eaters, 30 per cent mixed eaters and 18 per cent millet eaters. The district-wise distribution is given below.

Table VIII: Percentage of population consuming the constituents of cereals

District	Rice eaters	Mixed eaters	Millet eaters
Chengalput	51	47	2
South Arcot	38	47	15
North Arcot	23	67	10
Salem	27	36	37
Coimbatore	52	21	27
Tiruchirapalli	43	28	29
Thanjavur	74	5	1
Madurai	42	21	37
Ramanathapuram	39	48	13
Tirunelveli	65	20	15
The Nilgiris	42	41	17
Kanyakumari	100	-	-

The table indicates that the percentage of population of pure millet eaters is the highest in Salem, Madurai, Tiruchirapalli and Coimbatore.

Significant changes in the food habits of the people in the State have taken place since 1961-62 with increase in percapita income (percapita net domestic product at constant prices increased by 15 per cent between 1970-71 and 1981-82); increasing urbanization and greater availability of fine cereals (rice and wheat) and that too at subsidized prices in the public distribution system. In fact, while the output of rice increased by 148 per cent between 1961-62 and 1979-80, that of coarse cereals declined by 2 per cent. The survey does not indicate the quantity consumed in rural and urban areas nor does it indicate the consumption level by income groups. It is useful at best as an indicator of the areas where coarse cereals are consumed either pure or mixed.

Data on actual consumption levels by expenditure groups in rural and urban areas of the State available from the N.S.S. surveys of consumer expenditure are given in Chapter VII: Consumption Pattern. The analysis of the data reveals that coarse cereals form a significant proportion of cereal consumption in the rural areas. In fact, in rural areas, the consumption of coarse cereals has increased from 28.2 per cent of total cereal consumption in 1961-62 to 33.2 per cent in 1977-78. On the other hand, in the urban area, since coarse cereals are regarded as "inferior good", the proportion to total cereal consumption is low, 5.8 per cent in 1977-78. With progressive urbanization, there has indeed been a decline in the proportion of coarse cereal consumption from 7.3 per cent in 1961-62 to 5.8 per cent in 1977-78.

The expenditure elasticity of demand for coarse cereals in rural and urban areas for the bottom quartile and for all consumers calculated from the N.S.S. 28th Round is given below:

Table IX: Expenditure elasticity of demand for coarse cereals 1973-74

	Bottom Quartile	All Consumers
Rural	0.26	-0.05
Urban	-0.40	-0.04

It may be noted that it is only for the bottom quartile in the rural areas that expenditure elasticity has been positive. A 10 per cent increase in per capita income (expenditure may be regarded as a proxy for income) for the bottom quartile may be expected to lead to a 2.6 per cent increase in consumption. In the urban areas

on the other hand, even for the bottom quartile, the expenditure elasticity has been negative indicating that an increase in per capita income will lead to the substitution of fine cereals for coarse cereals in consumption.

What is of importance is the proportion of the population covered by the bottom quartile.. According to a study on consumption and nutritional patterns of ICRISAT mandate crops in India,[6] the expenditure groups Rs.0-24 and Rs.24-34 (which together roughly corresponds to the bottom quartile) constituted 23.6 per cent of rural population in the country in 1973-74. They are among the poor according to the Planning Commission norm of Rs.37 (poverty line) in rural areas in 1970-71 prices. It is this group, therefore, which has a positive income elasticity of demand for coarse cereals.

The identification of occupational status and consumption of cereals was undertaken by the Committee on Cost of Agricultural Commodities (1974), Government of Tamil Nadu. The findings[7] of the Committee are given below:

Table X: Occupational Status and Consumption of Cereals (daily consumption in gms. per adult)

	Rice	Millets	Wheat	Total
Non-working cultivators	493	17	20	530
Working cultivators	354	272	3	629
Agricultural labourers	286	232	3	541

Thus it is the working cultivators and agricultural labourers who mainly consume coarse cereals; their

consumption constitutes 43 per cent of their total consumption of cereals. Coarse cereals are a sustaining work food. The consumtion of agricultural labourers would have been higher but for the shift from payment in kind to payment in cash which is now confined to harvesting operations mainly. Also a preference for rice and wheat in the rural areas of the State has been developed over the years by the practice of not supplying coarse cereals through fair price shops. This is acting as a damper on growth in consumption of coarse cereals. Moreover, since rice and wheat are sold at subsidised prices by fair price shops, the differential in price of fine cereals and coarse cereals at retail level has virtually disappeared (in February 1984 while the retail price of jowar, bajra and ragi ranged between Rs.1.70 and Rs.2.60 a kilogram, the retail issue price of rice through Fair Price Shops has ranged between Rs.1.75 and Rs.2.15 depending on the variety). This development naturally tends to divert consumption from coarse to fine cereals.

10. Supply and Demand Constraints: Supply Constraints

The development of hybrid varieties of jowar and bajra and improved varieties of ragi have led the way in increasing the productivity of coarse cereals. However, in view of the highly unstable agro-climatic conditions under which these crops are grown, the new technology will not be able to give as impressive a yield as the fine varieties of cereals. The package of practices consisting of improved seed, fertilizers and plant protection measures are suitable mainly for irrigated areas, which under coarse cereals have been declining. The question of appropriate technology for development of coarse cereals becomes relevant in this connection. Should it be resource-based or crop-based? The resource-based development focusses on irrigation,

soil conservation and moisture conservation. The crop-based strategy of development is based on evolving improved and drought resistant varieties. The experience of resource-based development particularly irrigation, as pointed out already, has been that it has led to a shift from low-value coarse cereal to high value fine cereals or commercial crops such as cotton and groundnut. However, since the adoption rates for new technology are much higher for irrigated coarse cereals since irrigation reduces the risks of new technology as well as increases profitability, the extension of minor irrigation facilities to dry farming areas is particularly needed. Also since the new technology involves higher cost, it is necessary to evolve a low cost technology for coarse cereals which are low valued and have low income elasticity of demand. It has been emphasized that any technology that can help in making efficient use of available moisture can go a long way in stabilizing and raising production.[8]

Another constraint to expansion of production of coarse cereals has been government policies in respect of procurement. Although a procurement price for coarse cereals is announced by the Govt. of India, no purchases at this price have been made by the State Government except on rare occasions as in 1984 when ragi was purchased in the open market by the Tamil Nadu Civil Supplies Corporation and distributed through Fair Price Shops. Due to restricted market for the components of coarse cereals, whose production is confined to certain areas and consumption to certain classes, any significant increase in production results in a severe fall in prices, which in turn reduces the incentive to step up production. If this is to be counteracted, trade as between surplus and deficit regions has to be promoted.

Demand Constraints

Demand for coarse cereals is said to be "class specific". As has been mentioned earlier, a sizeable proportion of the demand arises from working cultivators and agricultural labourers in the State. These crops release energy over a long period and as such labourers and small farmers can work without sweating for much longer period than if they consumed rice. These crops are also nutritionally superior to rice; whereas the protein content of rice is only 6.8 (value per 100 grams of edible portion), that of jowar is 10.4, bajra 11.6 and ragi 7.3.

However, since the expenditure elasticity of demand of coarse cereals is low, it is apprehended that "the demand for them for human consumption is likely to shrink further with increase in income and living standards of both producers and present consumers of these crops".[9] Demand for human consumption could be increased by State procurement of coarse cereals, so as to make them available for school and hospital feeding programmes and for food for work projects.

At the same time, it is necessary to explore alternative sources of demand. A major development influencing the consumption of coarse cereals in developing countries has been the rapid expansion and intensification of livestock production.[10] In fact, consumption of animal products in developing countries has grown much faster than in the developed countries. The expansion has been most dynamic in the poultry sector, resulting in a sharp increase in feed requirements particularly in the demand for maize. With increase in per capita income, a similar development could take place in the State as well. The production of maize in Tamil Nadu is insignificant, about 40 thousand tonnes. If intensive commercial production of poultry is developed

in the State, the demand for maize would grow substantially. It has been estimated that maize accounts for almost 90 per cent of total coarse cereals used for feed in Asia in view of the high nutritive value of maize for non ruminant feed.

As regards other livestock, there has been no estimate of the quantity of coarse cereals used as feed. A certain quantity of fodder jowar is grown. The pressure of population on food requirements limits the quantities of coarse cereals that can be utilized for animal feed. There is no clear distinction between food and feed grains. It may be mentioned that competition between the two uses (human consumption and livestock feed) may result in higher prices for coarse cereals causing hardship to lower income groups. This underlines the need for greater attention to be paid to research and technology to improve yields of coarse cereals and thereby reduce their cost of production.

Another source of demand for coarse cereals is industrial use. Maximum use has so far been made only of maize by the starch industry. Jowar can also be used for starch manufacture. Many of the millets can be used in brewing. The germ of maize and bajra contains a high percentage of oil compared to other millets. The crude oil can be used in soap manufacture and refined oil for edible purposes. In view of these potentialities, the National Commission on Agriculture came to the conclusion that "there is a fit case to lay more and more emphasis on increasing the production of millet crops."[11]

Conclusion

Contrary to popular belief, marginal and small farmers account for only slightly over a third (36 per cent

of the area of operational holdings) of coarse cereal acreage in the State. In respect of consumption, a sizeable proportion is accounted for by low income groups for whom it is a staple food. The characteristics of these crops are that they have a high degree of resistance to drought and are capable of thriving in poor and shallow soils. A technology suited to these areas has yet to be developed as attention hitherto has been focussed mainly on irrigated crops. The strategy for development of these crops lies in a combination of resource development (minor irrigation and soil and moisture conservation) and evolving of improved crop varieties.

The inclination to use fine cereals, ("elite cereals" as they are sometime called) will become more owing to their greater availability resulting from increased production. It is only with the application of new technology since 1970-71 that the productivity of coarse cereals has witnessed an increase. But it cannot be expected that the new technology will show the same impressive increase in production as in respect of fine cereals in view of the decrease in irrigated area under coarse cereals. In view of the low expenditure elasticity of demand for coarse cereals even for the low income groups, it is necessary to develop alternative sources of demand for them to overcome the demand barrier. In fact, the coarse cereals are caught between the two blades of a scissors (supply and demand), to use a Marshallian analogy.

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Annexure: Table I: Area, Production & Productivity of Coarse Cereals in the State

(Area 000 hectares; Production 000 tons; Productivity Kg per hectare)

Crop	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71
Jowar												
Area	771	774	768	745	742	767	759	743	705	700	782	742
Production	631	631	601	590	572	552	513	558	525	495	617	543
Productivity	818	815	783	792	771	720	676	751	745	707	789	732
Bajra												
Area	520	489	489	471	449	440	400	415	430	457	482	475
Production	312	301	306	319	293	279	235	304	287	288	325	312
Productivity	600	616	626	677	693	634	588	733	667	630	674	657
Ragi												
Area	368	364	336	342	321	320	329	313	312	301	307	283
Production	376	360	338	350	318	321	292	323	309	292	283	334
Productivity	1022	989	1006	1023	991	1003	888	1032	990	970	922	1180
Small Millets												
Area	533	530	548	503	484	512	478	489	452	449	487	466
Production	416	427	435	389	374	392	361	361	367	331	369	360
Maize												
Area	-	-	-	-	-	-	-	-	-	-	-	14
Production	-	-	-	-	-	-	-	-	-	-	-	16
Total Coarse Cereals												
Area	2192	2157	2141	2061	1996	2039	1966	1960	1899	1907	2058	1980
Production	1735	1719	1680	1648	1557	1544	1401	1546	1488	1406	1594	1565

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ible I (contd.)

Crop	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Jowar												
Area	718	680	641	675	817	842	751	696	721	591	703	673
Production	464	524	576	406	716	794	719	636	653	451	552	405
Productivity	646	771	899	601	876	943	997	914	906	763	785	602
Bajra												
Area	449	428	401	373	450	456	437	409	370	328	336	296
Production	273	260	340	215	329	461	374	454	329	264	310	208
Productivity	608	607	848	576	731	1011	856	1110	889	804	922	702
Ragi												
Area	292	279	263	283	320	290	291	280	252	197	212	176
Production	315	289	377	348	480	340	410	420	357	258	377	220
Productivity	1079	1036	1205	1230	1503	1170	1411	1500	1407	1314	1778	1247
Small Millets												
Area	410	377	372	351	419	468	440	376	373	268	319	297
Production	317	281	282	125	301	330	326	286	281	203	242	218
Maize												
Area	13	15	19	18	25	19	18	22	23	19	24	18
Production	15	16	20	12	26	20	19	23	25	20	26	41
Total Coarse Cereals												
Area	1862	1779	1696	1700	2031	2062	1937	1763	1739	1403	1594	1460
Production	1384	1370	1535	1106	1853	1945	1848	1819	1645	1196	1507	1092

Source: Season and Crop Reports (Various Issues); Tamil Nadu - An Economic Appraisal (Various Issues); Government of Tamil Nadu.

ANNEXURE

Table II: Area, Yield and Production of Coarse Cereals in the State for triennium ending with 1961-62, 1971-72, 1979-80, and 1982-83.

Area in 000 ha.
Production 000 tons
Yield in Kg. per ha.

Crop	1961-62	1971-72	1979-80	1982-83	Compound Growth Rates (Per cent per annum)	
					Average of triennium 1961-62 & 1971-72	Average of triennium 1971-72 & 1979-80
Jowar						
Area	771	747	723	656	-0.3	-0.5
Yield	805	722	926	716	-1.1	+2.8
Production	621	541	669	470	-1.4	+2.4
Bajra						
Area	499	469	405	320	-0.6	-1.6
Yield	614	646	952	810	+0.5	+4.4
Production	306	303	386	261	-0.1	+2.7
Ragi						
Area	356	294	274	195	-2.0	-0.7
Yield	1006	1060	1442	1446	+0.5	+3.2
Production	356	311	396	285	-1.5	+2.7
Maize						
Area	-	14	21	20		
Yield	-	-	-	-		
Production	-	15	22	29		
Small Millets						
Area	537	470	418	295	-1.4	-1.3
Yield	-	-	-	-	-	-
Production	426	372	321	221	-1.1	-1.2

Source: Same as for Annexure Table I.

Annexure

Table: III Area, Production and Productivity of Coarse Cereals at District level[1] for Triennium ending with 1961-62, 1971-72, 1978-79 & 1982-83

(Area 000 hectares; Production 000 tons; Productivity Kg. per hectare)

District	Jowar				Bajra			
	1961-62	1971-72	1979-80	1982-83	1961-62	1971-72	1979-80	1982-83
Chengalpattu								
Area	1.9	1.5	0.6	1.0	7.3	8.2	4.7	3.8
Production	1.2	1.1	0.6	0.9	3.8	5.5	8.8	6.8
Productivity	635	747	964	832	575	717	1867	1699
South Arcot								
Area	47.7	36.8	23.3	21.3	48.9	57.9	72.6	78.9
Production	19.2	32.0	32.3	16.4	20.4	43.8	105.7	81.6
Productivity	404	783	1365	760	417	757	1465	1016
North Arcot								
Area	48.0	37.8	31.3	40.3	18.9	16.6	14.3	14
Production	34.0	37.8	38.0	39.0	10.2	13.6	17.3	12
Productivity	706	896	1231	960	542	821	1185	749
Salem								
Area	145.8	86.3	84.0	70.0	94.5	56.3	40.6	19.0
Production	130.0	58.8	55.0	44.0	51.5	33.3	27.3	11.0
Productivity	891	679	654	470	545	593	677	569
Dharmapuri								
Area	-	54.9	62.0	49.0	-	13.2	10.3	7.3
Production	-	38.9	73.0	51.0	-	7.9	9.0	7.0
Productivity	-	707	1481	1034	-	560	921	930
Coimbatore (including Periyar area)								
Area	204.4	204.9	213.2	189.3	66.8	57.2	42.2	28.0
Production	158.1	116.2	147.3	98.3	50.5	37.6	40.3	28.3
Productivity	774	564	787	436	757	654	978	1010

1/ Nilgiris & Kanyakumari Districts have not been included as area and production have been insignificant.

contd ...

Table III (contd.)

District	Jowar				Bajra			
	1961-62	1971-72	1979-80	1982-83	1961-62	1971-72	1979-80	1982-83
Tiruchirapalli								
Area	133.1	138.1	131.0	127.6	101.8	99.8	88.3	71.7
Production	92.2	79.8	94.0	80.6	66.6	57.5	59.0	33.7
Productivity	693	577	656	626	654	575	665	472
Pudukottai								
Area	-	-	2.9	1.0	-	-	105	1
Production	-	-	2.5	1.0	-	-	1.3	1
Productivity	-	-	882	-	-	-	-	-
Thanjavur								
Area	1.5	1.3	N.S.	N.S.[2]	1.1	0.9	1.0	N.S.
Production	1.8	1.5	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Productivity	1180	1111	-	-	-	-	-	-
Madurai								
Area	139.6	138.4	138.0	115.7	19.9	10.5	26.0	18.3
Production	1.8	1.5	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Productivity	1180	1111	-	-	-	-	-	-
Ramanathapuram								
Area	14.1	13.0	12.3	13.0	61.6	52.7	41.7	28.3
Production	11.6	9.5	11.3	10.0	40.9	30.1	39.0	21.0
Productivity	829	726	919	696	666	961	931	743
Tirunelveli								
Area	34.7	33.9	24.0	26.3	79.3	76.6	62.7	28.3
Production	38.4	36.0	46.3	36.3	43.7	52.6	48.7	21.0
Productivity	1102	1065	1941	984	551	687	775	844

2/ Not significant.

contd ....

ible III (contd.)

District	Ragi				Small Millets			
	1961-62	1971-72	1979-80	1982-83	1961-62	1971-72	1979-80	1982-83
engalpattu								
rea	32.7	24.3	18.4	-	7.4	4.9	3.2	-
roduction	28.7	28.8	25.7	-	4.6	4.1	2.7	-
roductivity	882	1178	1386	-	-	-	-	-
outh Arcot								
rea	25.9	21.8	19.0	-	60.0	39.7	38.6	-
roduction	28.3	25.0	35.7	-	84.1	55.5	52.6	-
roductivity	1091	1147	1871	-	-	-	-	-
orth Arcot								
rea	33.9	27.1	21.0	-	43.7	29.5	23.0	-
roduction	40.4	32 0	36.3	-	36.4	22.5	13.6	-
roductivity	1194	1184	1717	-	-	-	-	-
alem								
rea	135.6	32.1	34.3	-	122.2	25.6	31.7	-
roduction	116.4	32.6	55.0	-	61.4	14.5	18.3	-
roductivity	860	1018	1655	-	-	-	-	-
armapuri								
rea	-	85.8	93.7	-	-	68.3	71.1	-
roduction	-	50.9	114.5	-	-	51.4	33.8	-
roductivity	-	594	1220	-	-	-	-	-
oimbatore (including Periyar)								
rea	40.9	34.1	33.1	-	40.8	41.3	32.5	-
roduction	49.0	36.4	54.6	-	20.7	31.6	23.2	-
roductivity	1199	1071	1556	-	-	-	-	-

contd ....

Table III (contd.)

District	Ragi				Small Millets			
	1961-62	1971-72	1979-80	1982-83	1961-62	1971-72	1979-80	1982-83
Tiruchirapalli								
Area	20.5	14.6	5.6	-	86.1	80.5	61.9	-
Production	20.4	34.5	9.5	-	95.5	82.7	62.8	-
Productivity	996	1041	1698	-	-	-	-	-
Pudukottai								
Area	-	-	5.0	-	-	-	21.1	-
Production	-	-	3.7	-	-	-	22.1	-
Productivity	-	-	-	-	-	-	751	-
Thanjavur								
Area	4.3	2.8	1.0	-	15.3	13.8	5.6	-
Production	4.8	3.0	1.8	-	16.9	13.8	9.8	-
Productivity	1124	94	1843	-	-	-	-	-
Madurai								
Area	15.8	10.5	6.0	-	60.2	66.6	52.3	-
Production	20.0	12.1	10.7	-	39.4	43.6	34.2	-
Productivity	1255	1162	1311	-	-	-	-	-
Ramanathapuram								
Area	35.3	30.1	26.4	-	66.7	66.3	51.5	-
Production	36.0	29.2	32.4	-	47.1	50.9	36.0	-
Productivity	1013	963	1234	-	-	-	-	-
Tirunelveli								
Area	9.8	10.0	7.6	-	24.6	29.7	24.1	-
Production	12.8	11.7	14.7	-	8.5	15.4	12.0	-
Productivity	1313	1273	1920	-	-	-	-	-

Source: Same as for Annexure Table I.

References

1. Jowar is mainly grown in areas having 800-850 mm of rainfall, bajra between 600-650 mm.

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CHAPTER V

PULSES: A SIGNIFICANT SECTOR OF THE FOODGRAIN ECONOMY

Concern over providing a minimum of calories to the people has led to over-emphasis on cereals in India. The nutritional dictum "look after the calories and the proteins will look after themselves" has reinforced this tendency. The result has been under-rating the importance of pulses in production and consumption.

1. Role of pulses in production and consumption

In the cropping system, pulses play a crucial role. They can survive under dry conditions due to their deep root system which helps to tap moisture from the sub-soil layer. They can improve soil fertility by nitrogen fixation as other legumes. Further, they can increase the yield of crops sown in mixture as well as serve as a useful green manure crop. However, these advantages have not enabled them to meet the competition of more remunerative cereals.

From the stand point of consumption, pulses are an important component of a balanced diet. In a low income economy such as that of India, pulses constitute the main source of protein in the human diet. Compared to rice, whose protein content is 6.6 per cent, and that of jowar, bajra and ragi 10.4, 11.6 and 7.3 per cent respectively, the protein content of pulses is 22 to 24 per cent, three times more than that of rice, more than twice that of jowar and bajra and three times more than that of ragi. A balanced diet, would therefore, have to provide for a combination of cereals and pulses. Moreover, pulses have a sufficient supply of lysine in which cereals are deficient.

The Indian Council of Medical Research (ICMR) recommended in 1971 an intake of 70 gms. of pulses per capita per day, for a balanced diet. This, however, was revised in 1981 to 40-60 gms per capita per day (depending upon the nature of work) by raising the cereal content as well as the oil and fat content of a balanced diet. 1/

2. Declining per capita net availability of pulses in the country

The per capita net availability of pulses in the country has been declining over the years with the result that it does not come up even to the level of the reduced pulse content of a balanced diet recommended by the ICMR. The following table indicates the per capita net availability of pulses in the country from 1971.

1/ The 1981 ICMR recommendations for a balanced diet for an adult male is as follows:

	Balanced diet (in gms.) Adult Male		
	Sidentary work	Moderate work	Heavy work
Cereals	406	520	670
Pulses	40	50	60
Leafy vegetables	40	40	40
Other vegetables	60	70	80
Roots and Tubers	50	60	80
Milk	150	200	250
Oils and fats	40	45	65
Sugar and jaggary	30	35	55

Source: C. Gopalan: National Nutrition Policy: India International Centre, Quarterly: Vol.12, November 1985.

Table I: Per capita net availability of pulses (All-India) gms. per day

Year	Net availability
1971	51.2
1972	47.0
1973	41.1
1974	40.8
1975	39.7
1976	50.5
1977	43.3
1978	45.5
1979	44.7
1980	30.9
1981	37.2
1982	39.2
1983	38.4
1984	41.0

(Source: Bulletin on Food Statistics 1982-84: Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture: Govt. of India).

It will be seen that the per capita net availability of pulses which was 51.2 gms. per day in 1971 has declined to 41.0 gms. per day in 1984.

The decline in per capita net availability is to be ascribed to two factors; stagnant production and population growth. It may be mentioned that there is practically no possibility of increasing domestic availability by imports as India itself is the largest producer and consumer of pulses in the world.[1/]

1/ The world production of pulses has been estimated at 26 million tons of which Indian production has been 13 million tons (1984-85).

Table II indicates the area, production and yield of total pulses as well as that of its main components, gram, tur, moong and urad in the country from 1970-71 to 1983-84. The annual growth rate of area has been a meagre 0.4 per cent while that of production has been even less 0.2 per cent. Yield per ha has witnessed a slight decline. The decline in yield may be attributed to shift of irrigated area from pulses to relatively more profitable cereals and to the bringing of marginal land under pulses. It may be mentioned that the large scale adoption of the seed-fertiliser technology has resulted in an increase in the relative profitability of wheat leading to a shift in area from gram and other rabi pulses to wheat.

3. Relative importance of States in area and production of pulses

Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Orissa account for about 53 per cent of area and 65 per cent of production of pulses in the country. Madhya Pradesh stands first with 21 per cent and 24 per cent respectively of all-India area under and production of pulses. The share of Tamil Nadu in all-India area under and production of pulses has been insignificant, about 3 per cent and 2 per cent respectively. The following table indicates the percentage share of States in all-India area and production of pulses.

Table II

All-India Area, Production and Yield of pulses

Year	Area (000 ha)					Production (000 tons)					Yield (kg. per ha.)				
	Gram	Tur	Moong	Urad	Total pulses	Gram	Tur	Moong	Urad	Total pulses	Gram	Tur	Moong	Urad	Total pulses
1970-71	7839	2655	2066	2067	22,534	5199	1833	700	656	11818	663	709	339	318	524
1971-72	7912	2346	1837	1868	22,151	5081	1683	560	535	11093	642	718	306	286	501
1972-73	6968	2424	1962	1957	20,915	4537	1928	524	613	9907	651	795	267	313	474
1973-74	7761	2646	2383	2369	23,427	4099	1408	797	744	10007	528	532	334	314	427
1974-75	7042	2529	2294	2169	22,024	4015	1834	652	671	10014	570	725	284	309	455
1975-76	8320	2671	2517	2161	24,454	5880	2099	798	757	13040	707	786	317	350	533
1976-77	7974	2566	2404	2074	22,983	5424	1725	797	693	11361	680	672	331	334	494
1977-78	7974	2626	2437	2172	23,497	5410	1930	870	747	11972	678	735	357	344	510
1978-79	7708	2635	2547	2374	23,657	5739	1887	876	727	12183	745	716	344	320	515
1979-80	6985	2731	2594	2719	22,259	3356	1757	698	757	8572	481	643	269	278	385
1980-81	6584	2842	2843	2830	22,457	4328	1957	979	959	10627	657	689	344	339	473
1981-82	7868	3004	2853	2776	23,843	4642	2237	1060	1010	11507	590	745	372	364	483
1982-83	7399	2844	2926	2714	22,833	5290	1989	1060	964	11857	715	680	403	355	519

Source: Same as for Table I

Table III: Percentage Share of States in all-India Area and Production of Pulses (Average 1981-82 to 1983-84)

State	Percentage share in area	Percentage share in production
Andhra Pradesh	6.0	4.8
Assam	0.5	0.5
Bihar	5.2	6.6
Gujarat	3.1	4.2
Haryana	3.4	3.1
Karnataka	6.6	5.3
Madhya Pradesh	21.4	23.6
Maharashtra	11.8	9.9
Orissa	7.3	6.9
Punjab	1.0	1.3
Rajasthan	10.5	14.5
Tamil Nadu	2.8	2.0
Uttar Pradesh	12.6	22.1
West Bengal	1.7	2.0

4. Pulses in Tamil Nadu foodgrain economy

While at the all-India level, gram is the most important pulse crop accounting for 32 per cent of area and 45 per cent of production, the pulse crops important in the State (from the stand point of human consumption) have been tur (red gram), moong (green gram), and urad (black gram). However, kulthi (horse gram) which is predominently used as animal feed, occupies the largest extent of area under any pulse crop (about 28 per cent of total area under pulses). Table IV gives the area, yield and production of principal pulses in the State. It will be noticed that of the pulses important for human consumption,

urad (black gram) is the most important contributing 25 per cent to total pulse area and 17 per cent to production (triennium ending with 1981-82). Next comes tur (red gram) contributing 13 per cent to total pulse area and an equivalent percentage to production. Moong (green gram) contributes 13 per cent to total pulse area and 8 per cent to production.

At the all-India level, the contribution of pulses to total food-grain production has been falling. In 1970-71, the production of pulses constituted 11 per cent of total food-grain production. In 1982-83, this had declined to 9 per cent. In Tamil Nadu, on the other hand, the proportion of pulse production to total foodgrain production witnessed an increase from 2.3 per cent to 3.3 per cent during the same period; also there has been an increase in pulse area from 9.4 per cent to 16.4 per cent of food-grain area. The reasons for this divergent performance has been that in the rest of India, gram, the most important pulse crop, is grown in temperatures approximating to that of wheat and since wheat is relatively more profitable than gram, the latter is being elbowed out by the former. The calculation of costs and returns from pulses and other competing crops in Haryana, for instance, indicates that whereas the net return per ha of gram has been Rs. 501, that of wheat has been Rs. 724.[1] Thus, wheat has been found to be more profitable than gram, leading to a shift of area from gram to wheat.

The shift in acreage from pulses to cereals has not been noticeable to any great extent in the state. Area shifts may be defined as changes in the ratio of area under pulses to gross cropped area. These shifts can take place either from pulses to other foodgrain crops and vice versa or from pulses to non-foodgrains crops and vice versa. This has been expressed in the following:[2]

$$P/GCA = P/F \times F/GCA$$

Table IV: Area, Yield and Production of Principal Pulses in Tamil Nadu

Area 000 ha., Yield kg per ha., Production 000 tons.

	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
(Redgram)													
a	63	100	94	95	68	81	84	81	73	68	60	78	82
ld	367	400	488	508	461	520	509	467	691	632	434	481	275
duction	29	50	46	48	31	42	43	38	51	43	35	46	38
ng (green gram)													
a	60	80	101	122	76	78	80	89	103	97	94	76	59
ld	193	300	348	333	340	208	368	378	361	330	247	272	283
duction	12	24	35	41	26	16	30	33	37	33	29	26	18
d (black gram)													
a	97	97	148	158	96	93	120	147	167	172	180	144	119
ld	251	304	334	328	268	225	345	421	391	327	267	296	263
duction	24	30	52	52	26	21	41	62	65	56	61	53	43
thi (horse gram)													
a	216	194	234	218	174	167	197	193	207	195	161	149	177
ld	216	244	213	215	128	213	232	236	238	233	233	242	434
duction	47	48	50	47	22	36	45	46	49	46	38	36	77
al Pulses[1]													
a	482	525	622	663	464	471	545	582	616	606	533	584	642
ld	242	293	309	309	247	271	324	337	355	322	275	314	311
duction	117	154	192	205	115	127	177	196	219	195	147	183	200

[1] includes also pulses other than tur, moong, urad and kulthi.

Source: Area and Production of Principal Crops in India, 1981-84: Directorate of Economics and Statistics, Ministry of Agriculture and Co-operation, Government of India.

Where P/GCA is the ratio of area under pulses to gross cropped area, P/F is the ratio of area under pulses to area under foodgrains and F/GCA is the ratio of area under foodgrains to gross cropped area. "If a fall in the ratio P/GCA is accompanied by a fall in the ratio of P/F and no change occurs in F/GCA, then all the change in P/GCA can be attributed to a shift out of pulses into cereals and vice versa. If a fall in the ratio of P/GCA is accompanied by a fall in the ratio of F/GCA, with no change in P/F, then all the shift out of pulses is explained by a shift into non-foodgrain crops and vice versa". 3/

The ratio of area under pulses to gross cropped area and to area under foodgrains and the ratio of area under foodgrains to gross cropped area in the State are indicated in Table V.

Table V: Ratio of area under pulses to gross cropped area and to area under foodgrains and the ratio of area under foodgrains to gross cropped area in Tamil Nadu

	Area under pulses	Gross cropped area	Ratio of area under pulses to gross cropped area	Area under foodgrains	Ratio of area under pulses to area under food grains	Ratio of area under foodgrains to gross cropped area
1970-71	482	7384	6.5	5110	9.4	69.2
1971-72	525	7641	6.9	5161	10.2	67.5
1972-73	622	7699	8.1	5282	11.8	68.6
1973-74	663	7648	8.7	5065	13.1	66.2
1974-75	464	6640	7.0	4404	10.5	66.3
1975-76	471	7235	6.5	5068	9.3	69.8
1976-77	545	7147	7.6	4906	11.1	68.6
1977-78	582	7768	7.5	5303	11.0	68.3
1978-79	616	7684	8.0	5156	11.9	67.1
1979-80	606	7717	7.9	5253	11.5	68.1
1980-81	533	6470	8.2	4247	12.6	65.6
1981-82	584	6909	8.5	4662	12.5	67.5
1982-83	642	6056	10.6	3929	16.3	64.9

It will be seen that barring 1974-75 and 1975-76, the ratio of area under pulses to gross cropped area has been increasing; so also the ratio of area under pulses to area under foodgrains except in 1975-76. Thus the shift of area from pulses to cereals which has taken place in most of the rest of India has not occurred in Tamil Nadu.

The reason for the above divergent behaviour is to be ascribed to the conditions under which the pulse crop is grown in the State. Pulses in the State are mostly grown as a mixed crop or intercrop with cereals, millets, oilseeds, cotton etc. except in the case of irrigated pulses in which case they are grown as a pure crop during summer months after harvest of paddy. Paddy is the main crop in the first season; in the second season, pulses are grown as pure crops on irrigated land or as summer crop in rice fallows after second season paddy. Pulses grown as pure crop on irrigated acreage is limited since the gross area irrigated constitutes only 2.6 per cent of the total area under pulses (average of triennium ending with 1982-83). Thus, pulses are predominently rainfed crops.

If at all there is competition with cereal crops, it can only be with coarse cereals. But the price factor has been to the advantage of pulses. The following table indicates the annual average (weighted) producer prices of pulses as well as that of cholam and cumbu in the State from 1975-76.

Table VI: Annual Average (weighted) Producer Prices of Pulses and Cholam and Cumbu in the State

Year	Tur (red gram)	Moong (green gram)	Urad (black gram)	Cholam	Cumbu
1975-76	126.25	131.92	186.92	96.54	95.19
1976-77	170.00	161.09	228.27	109.92	96.04
1977-78	226.33	214.00	252.92	100.28	96.95
1978-79	300.00	294.93	284.82	80.52	74.93
1979-80 1/	336.69	367.53	289.30	110.94	111.52
1980-81 2/	359.50	397.34	306.13	137.08	135.84
1981-82 3/	305.36	278.21	274.03	135.20	123.19

(Source: Season and Crop Reports)

1,2,3 refers to weighted average peak marketing wholesale prices.

It will be noticed that in 1981-82, the price of tur (red gram) was 2.3 times that of cholam and 2.5 times that of cumbu; moong (green gram) was 2.1 times and 2.3 times respectively. Hence any shift of acreage from pulses to coarse cereals could hardly take place.

5. Growth rate of area and production of pulses in the State

Between the triennium ending with 1972-73 and that ending with 1982-83, area under pulses grew at the annual compound rate of 0.8 per cent. During the same period production grew by 1.1 per cent. There has been no breakthrough in production as manifested in the very low yield rates, lower than the all-India average. The following table indicates the relative position of the State in respect of yield.

Table VII: State-wise yield of Pulses (1981-82 to 1983-84 average) kg. per ha.

State	Yield
Andhra Pradesh	367
Assam	417
Bihar	598
Gujarat	624
Haryana	467
Karnataka	388
Madhya Pradesh	515
Maharashtra	392
Orissa	572
Punjab	582
Rajasthan	435
Tamil Nadu	327
Uttar Pradesh	824
West Bengal	572
All-India	505

The yield of pulses in Tamil Nadu is the lowest compared to all the other States. For the triennium ending with 1983-84, the yield has been 327 kg. per ha. The key to expansion in production, therefore, is to be found in stepping up the yield.

6. Disaggregation of Area and Production to District-level

Table VIII gives area and production of pulses by districts (1979-80 to 1981-82 average). Since both area under and production of pulses is insignificant in the Nilgiris and Kanyakumari, no figures have been indicated for these two districts.

Table VIII: Area and Production of Pulses by Districts (1979-80 to 1981-82 Average)

Area = '000 ha: Production = '000 tons

	Chengal pattu	South Arcot	North Arcot	Salem	Dharma puri	Coimba tore	Peri yar	Tiru chi ra palli	Pudu ko tai	Than ja vur	Madu rai	Rama na tha puram	Tiru nel veli	Nilgi ris	Kanya kumari
Tur (Redgram)															
Area	0.8	4.3	13.6	11.0	4.4	5.0	1.9	15.4	1.4	0.4	6.3	3.1	1.1	-	-
Production	0.5	1.9	9.5	7.7	3.7	3.2	1.3	6.3	0.9	0.3	4.1	1.7	0.6	-	-
Moong (Greemgram)															
Area	1.1	5.7	1.0	2.2	1.1	4.0	2.9	1.2	0.4	60.0	3.3	1.4	4.7	-	-
Production	0.4	2.4	0.5	0.9	0.4	1.6	0.9	0.5	0.1	18.5	1.4	0.4	1.3	-	-
Urad (Blackgram)															
Area	1.5	7.6	2.2	6.3	2.4	2.5	1.4	5.8	2.1	77.4	10.1	12.0	25.4	-	-
Production	0.5	6.3	0.3	2.5	0.9	0.9	0.5	2.4	0.7	23.6	4.7	4.8	8.3	-	-
Kulthi (Horsegram)															
Area	0.6	2.3	9.6	16.4	68.5	26.2	11.6	4.3	1.7	-	19.0	5.0	8.8	-	-
Production	0.2	0.6	2.0	3.9	16.2	6.3	2.8	1.0	0.4	-	4.4	1.2	2.0	-	-
Total Pulses[1] Area & production															
Area	4.2	40.0	28.2	40.0	83.1	56.1	25.7	29.7	6.3	139.0	49.2	24.3	42.1	N.S.[2]	N.S.
Production	1.6	14.2	12.9	16.2	22.5	18.6	7.0	10.7	2.2	42.4	16.6	9.0	12.7	N.S.	N.S.

1. Total area and production includes area under and production of other pulses as well.
2. N.S. = Not significant

It will be seen that Thanjavur stands first in respect of area; its share in total area under pulses in the State being 24.2 per cent. In Thanjavur pulses are grown only on rice fallows and since rice is the principal crop of the district, a large fallow area is put under pulses. Next to Thanjavur stands Dharmapuri with 14.9 per cent of the area under pulses in the State. However, 82 per cent of area under pulses in Dharmapuri is under kulthi or horse gram which is rarely used for human consumption. Madurai is the third largest pulse producing district accounting for 9.6 per cent of the total pulse area in the State.

As regards the components of pulses, Thanjavur has the largest area under urad (black gram) and moong (green gram). It accounts for 46.8 per cent of the area under the former and 67.4 per cent of the latter in the State. Other important urad growing districts have been Tirunelveli and Ramanathapuram. South Arcot comes next to Thanjavur in respect of area under moong. As regards tur (red gram), Tiruchirapalli, North Arcot and Salem stand first, second and third in respect of area.

In respect of production, the share of Thanjavur has been the highest in the production of urad (black gram) being 41.7 per cent of the production in the State. So also in respect of moong (green gram); the share of Thanjavur being 63.1 per cent. The share of other districts in the production of urad has been small; 8.3 per cent being the share of Tirunelveli and 6.3 per cent that of South Arcot. In respect of tur (red gram), North Arcot is the leading producer accounting for 23 per cent of the production in the State followed by Salem with 18.6 per cent and Tiruchirappalli with 15.3 per cent. In view of concentration of area under kulthi (horse gram) in Dharmapuri where the crop

is adaptable to the poor soils and adverse climatic conditions, bulk of the production (41 per cent) is accounted for by this district.

7. Consumption of Pulses

Per capita monthly consumption of pulses in rural and urban areas of the State by expenditure groups available from the State sample of the National Sample Survey 32nd Round (1977-78) is given below:

Table IX: Per capita monthly consumption of pulses[1/] (in kg.) 1977-78.

Expenditure class (in Rs)	Rural Area	Urban Area
0- 10	0.1	-
10- 20	0.14	0.07
20- 30	0.26	0.18
30- 40	0.35	0.27
40- 50	0.41	0.42
50- 75	0.63	0.56
75-100	0.93	0.93
100-150	1.24	1.28
150-200	1.62	1.43
200 and above	2.15	1.55
All classes	0.57	0.74

1/ Neither from the stand point of production nor from the stand point of consumption is gram important in the State.

Rural consumption has been consistently higher than urban consumption upto the expenditure group Rs. 30-40.

It is also higher for the upper expenditure groups Rs.150-200 and above. However, taking all classes together, urban consumption is higher than the rural. The decrease in consumption for the two upper expenditure groups in the urban area compared to the rural may be explained by the fact that the percentage of expenditure on pulses decreases as a proportion of total consumer expenditure at this level of expenditure, the higher expenditure groups spending more on other commodities. The following table indicates the monthly per capita consumer expenditure on pulses as a proportion to total consumer expenditure classes in rural and urban areas.

Table X: Per capita per month consumer expenditure on pulses as a proportion of total consumer expenditure by expenditure classes in rural and urban areas of the State in 1977-78 (per cent)

Expenditure class (in Rs)	Rural area	Urban area
0- 10	0.55	-
10- 20	2.92	2.08
20- 30	3.23	2.76
30- 40	3.59	3.08
40- 50	3.49	3.81
50- 75	4.07	4.28
75-100	4.29	4.42
100-150	4.08	4.27
150-200	3.92	3.43
200 and above	2.29	2.06
All classes	3.81	3.91

In respect of the three upper level expenditure classes (from Rs.100-150), the expenditure on pulses as a proportion of total consumer expenditure declines in both rural and urban areas.

It may be mentioned that pulses are only a supplementary food to cereals and hence there is a limit to the consumption of pulses. The quantity elasticity of demand for pulses for the State as a whole as calculated from the State Sample of the National Sample Survey in the 32nd Round 1977-78 comes to 0.37 indicating that a 10 per cent increase in expenditure will lead to a 3.7 per cent increase in quantity consumed. While the elasticity is no doubt higher than that for coarse cereals, it cannot be regarded as very substantial.

It is in respect of price that the responsiveness of consumption of pulses is substantial. It has been pointed out earlier that the farm harvest prices of pulses are much higher than that of coarse grains. The price elasticities for the rural expenditure classes in the country have been estimated to be -1.429 for the expenditure class Rs 0-24 (monthly per capita expenditure); -0.911 for the class Rs 24-34; and -0.630 for the class Rs 34-55.[4/] The numerically high price elasticities indicate substantial price responsiveness in consumption. For the lowest expenditure group for example, a 10 per cent fall in price of pulses would lead to a 14 per cent increase in consumption and vice versa. For the urban expenditure classes also, the price elasticities are substantial. For the equivalent expenditure classes in the urban areas, the price elasticities are estimated to be -1.07; -0.675; and -0.588 respectively. Thus, of the two factors determining demand (income and prices), it is price which is the dominant factor.

8. Net availability of pulses

To be comparable with the all-India data, net availability of pulses in the State has been arrived at by taking into account net production and adding to it imports from

other States. The State is heavily deficit in its requirements of pulses; slightly over five lakh tons are being imported annually from surplus States such as Rajasthan, Madhya Pradesh, Uttar Pradesh, Maharashtra, Karnataka and Andhra Pradesh. This import may be compared with the local production averaging about 2.0 lakh tons. Local production thus constitutes only about 25 per cent of total availability.

The per capita net availability of pulses in the State is indicated in Table XI.

Table XI: Per capita net availability of pulses in the State (gms. per day)

Year	Per capita availability
1971	44
1972	44
1973	43
1974	31
1975	38
1976	39
1977	40
1978	41
1979	39
1980	37
1981	37
1982	39

Per capita net availability per day which was 44 gms. in 1971 has declined to 39 gms. in 1982. It thus falls short of the revised nutritional norm for a balanced diet mentioned earlier. The high price elasticity indicates that consumption can be raised if pulses are made available at lower prices.

9. Characteristics of the pulse economy of the State:

The State's share in the overall production of pulses in the country is practically insignificant, being only 2 per cent. Within the State, there is a very significant gap between consumption and production. Unlike in some other States in the country, the lag in production has not been brought about by shift in area from pulses to cereals. This has been due to the fact that pulses are either grown as a mixed crop with cereals and oilseeds or in rice fallows. The lag in production has to be explained predominently in terms of the low level of productivity.

Pulses are grown as a rainfed crop and very rarely under irrigation (gross irrigated area under pulses constitutes only 2.6 per cent of total area under pulses 1980-81 to 1982-83 average). They are grown with little inputs such as improved seeds, fertilizers and plant protection. A break-through in pulse production can take place only by the adoption of improved technologies to be brought about by large scale demonstration of the use of inputs. What improved varieties alone can contribute to increased production is demonstrated by the experiments conducted in rice fallows by the Tamil Nadu Agricultural University which indicate a rise in yield of 20 to 30 per cent. Increased production hinges on improvements in productivity. This can pave the way to a fall in prices, stimulating thereby the consumption of pulses, the main source of protein for the population in the average income bracket.

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CHAPTER VI

Instability in Foodgrain Production

A major problem facing the foodgrain economy of the State has been the instability in foodgrain production. This springs from two factors (i) weather-induced fluctuations and (ii) fluctuations associated with the new technology. The marked fluctuations in output arising from these two factors have not been conducive to sustained growth. This poses the question: how to attain growth with stability?

1. Weather-induced fluctuations

Although 65 per cent of gross area under foodgrains (average for 1979-80 to 1981-82) are irrigated, there have been over the years marked fluctuations in foodgrain output due to rainfall variations. A close relationship is observable between the quantum of rainfall and the area brought under foodgrains as can be seen from the Table below:

Table I: Rainfall (in mm); Deviation from normal rainfall,* and Area Under foodgrains (1000 hectares)

Year	Rainfall	Deviation from normal	Foodgrain area
1970-71	913.1	-29.7	5109
1971-72	858.8	-84.0	5161
1972-73	990.7	+47.9	5282
1973-74	842.2	-100.6	5065
1974-75	647.4	-295.4	4403
1975-76	857.2	-85.6	5068
1976-77	941.4	- 1.4	4906
1977-78	1123.7	+180.9	5302
1978-79	949.8	+ 7.0	5155
1979-80	1091.3	+148.5	5253
1980-81	669.3	-273.5	4247
1981-82	956.2	+ 13.4	4662
1982-83	652.6	-270.2	3929
1983-84	1220.9	+278.1	4986

(* Normal represents the average for 50 years ended 1960, equivalent to 942.8 mm)

It will be noticed that out of the 14 years indicated above, 8 years have had rainfall below the normal. Even a good part of minor irrigation including controlled irrigation through wells is vulnerable to the vagaries of the monsoon.

When the actual rainfall was above the normal in 1972-73, the acreage under foodgrains rose to 53.0 lakh hectares and when the actual rainfall was very much below normal (by 295.4 mm) in 1974-75, the acreage declined to 44 lakh hectares. Again when the actual rainfall was above the normal (by 180.9 mm) in 1977-78, the acreage rose to 53.0 lakh hectares. It declined to 42 lakh hectares in 1980-81 when the actual rainfall was short of the normal by 273.5 mm. Thus there is a perceptible tendency for acreage to very with variations in actual rainfall from the normal.

Like the neighbouring Kerala State, Tamil Nadu enjoys the benefit of the South West monsoon (June to September) and North East monsoon (October to December). The South-West monsoon is important to the rainfed tracts to the north of the delta areas consisting of North Arcot, Chengalpattu and the remaining part of South Arcot district while the North-East monsoon is important for the region consisting of Ramanathapuram, Tirunelveli, Kanyakumari and parts of Madurai and Tiruchirapalli districts to the north of the delta. It may be mentioned that the main paddy crop (Samba crop) is grown between July and February.

Since the area effect on production is markedly less than the yield or productivity effect (vide Chapter III) it is the impact of rainfall variations on production through variations in productivity that is significant. Chart I indicates the actual rainfall, rice output and productivity of rice in the State for the period 1960-61

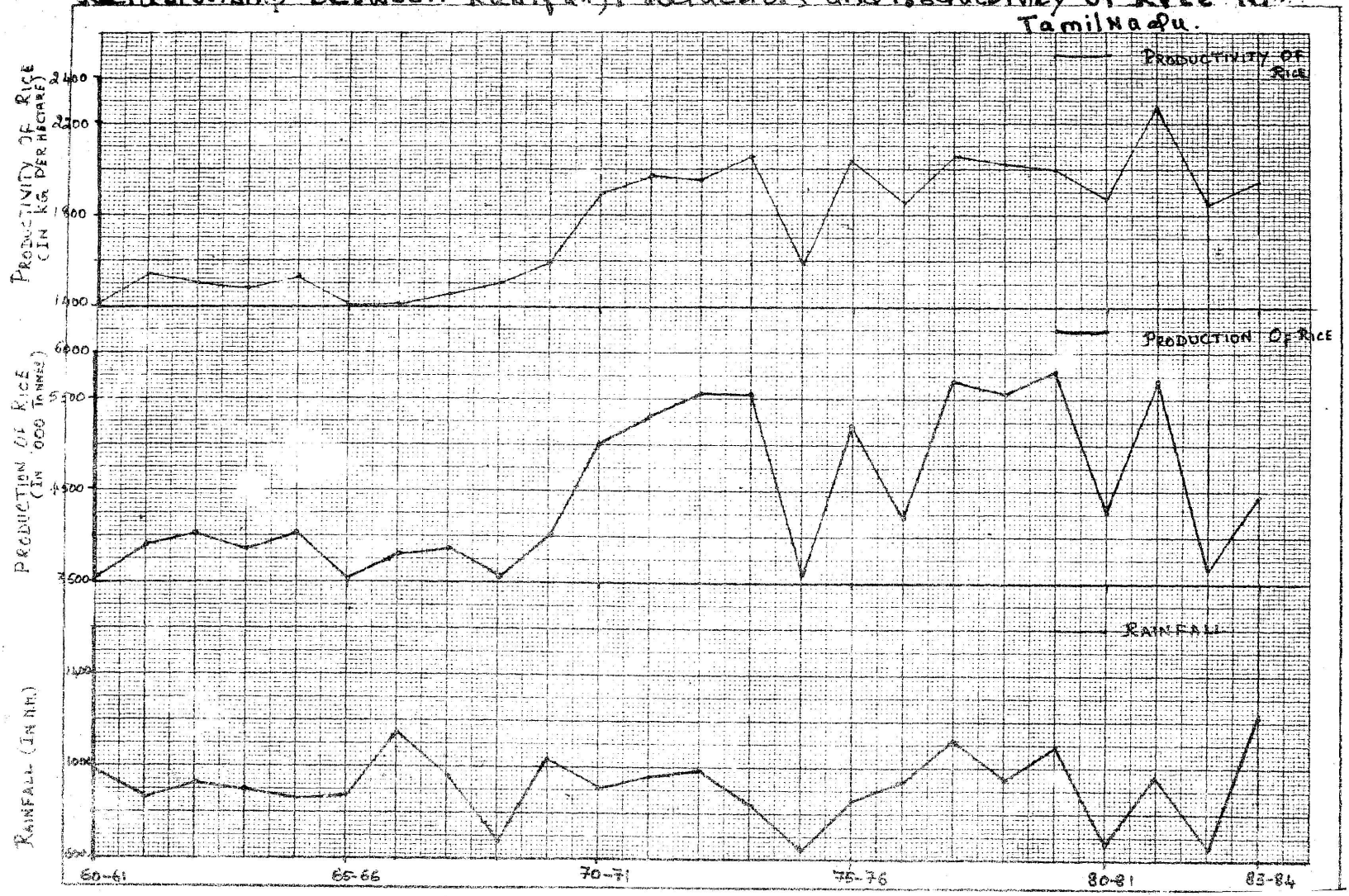
to 1983-84. The unfavourable monsoon in 1974-75 resulted in a decline in productivity of rice to 1597 kg per hectare from the level of 2055 kg per hectare touched in the previous year (1973-74). A very favourable monsoon in 1977-78 raised productivity to almost the same level as in 1973-74. The recurrence of unfavourable monsoon in 1980-81 and 1982-83 again reduced the level of productivity to 1861 kg per hectare and 1845 kg per hectare respectively (for the data on production and productivity of rice vide Annexure: Table I of Chapter III). The variations in productivity combined with variations in acreage in the same direction have had a marked impact on production.

Under conditions of below normal rainfall, the magnitude of variations in coarse cereal acreage has been less than that of rice due ostensibly to soil moisture being not so deficient for growing coarse grain. Also, if there has to be a reduction in acreage under major coarse cereals, minor coarse cereals can be grown which are drought-resistant crops. Thus whereas in 1974-75 rice acreage declined by 17 per cent compared with the previous year, there was a slight increase in acreage under coarse cereals. In 1980-81, when rice acreage fell by 21 per cent, major coarse cereal acreage declined only by 17 per cent compared with 1979-80. Similarly, in 1982-83 when rice acreage declined by 22 per cent compared with the previous year, the decline in major coarse cereal acreage has been only of the order of 8.4 per cent. Lesser variations in coarse cereal acreage in times of below normal rainfall has resulted in a reduction in the amplitude of fluctuations in production in comparison with rice.

How great the amplitude of fluctuations in production of foodgrains as a whole can be, when there is a substantial deviation from normal rainfall, can be seen in the shortfall

CHART I

Relationship between Rainfall, Production and Productivity of Rice in Tamilnadu.



in production in 1974-75, 1980-81 and 1982-83 (vide Annexure Table I). During these years, rainfall was below normal by 31.3 per cent, 29.2 per cent and 30.8 per cent respectively. As a consequence, foodgrain production in 1974-75 declined to 48.0 lakh tons from the previous year level of 73.0 lakh tons, representing a decline of 34.3 per cent while in 1980-81, the shortfall was of the order of 26 per cent (from 76.4 lakh tons in 1979-80 to 56.5 lakh tons in 1980-81) and in 1982-83, the shortfall was of the order of 32.6 per cent (from 73.8 lakh tons in 1981-82 to 49.8 lakh tons in 1982-83).

2. Impact on foodgrain prices

The impact on foodgrain prices in the State due to the shortfall in production in 1980-81 and 1982-83 is indicated in Table below:

Table II: Wholesale prices of foodgrains (Rs. per quintal) in the State (July to June)

Year	Rice II Sort	Jowar	Bajra	Ragi
1979-80	192.45	110.94	111.52	107.53
1980-81	230.18	137.08	135.84	148.83
1981-82	253.09	149.56	143.47	156.80
1982-83	283.50	151.15	156.0	175.54

Source: Season and Crop Reports (various issues)

Between 1979-80 and 1982-83, the rise in wholesale price of Rice II Sort has been of the order of 47.3 per cent that of jowar, bajra and ragi, 36.2 per cent, 40.0 per cent and 63.2 per cent respectively.

3. Adverse effect of rise in food grain prices on lower income groups

The rise in foodgrain prices affect especially the real income of lower income groups whose incomes are largely spent on foodgrains (Vide Chapter I). On the basis of the data collected through the All-India Consumer Expenditure Survey 1967 conducted by the National Council of Applied Economic Research (NCAER), the income effect of a change in foodgrain prices on grain consumption and on other goods for various income classes has been estimated.[1/] According to the estimate, "if foodgrain prices rise by 10 per cent, the lowest two deciles in expenditure, which initially spent Rs.4.830 per capita per month on foodgrains, experience a decline in per capita expenditure on foodgrains of the order of Rs. 0.285 or by 5.9 percent" compared with a reduction of only 0.2 per cent by the upper half of 10th decile.[2/] Thus much of the adjustment of higher foodgrain prices has to be effected by the lower income groups.

Besides reducing the real income of the lower income groups, any considerable decline in foodgrain production imposes a severe strain on the public distribution system by increasing the demand for foodgrains in the fair price shops. The rise in rice prices in 1981 in the State due to the short-fall in production in 1980-81 for instance led to larger off-take from fair price shops. The off-take which was of the order of 1.5 lakh tons each in 1979 and 1980, rose to 6.7 lakh tons in 1981.[3/] Due to the sharp fall in production of rice in 1982-83, 8.7 lakh tons had to be distributed in 1983.

4. Association of New Technology with fluctuations in foodgrain production

It has been pointed out that the seed-fertilizer technology while contributing to growth in yields is also associated with variations in production through yield variability stemming from use of HYV'S and larger application of fertilizers per unit of land.[4] Inputs such as fertilizers and improved seeds if used under conditions of stable irrigation contribute to growth with stability but if used under conditions of uncertain rainfall or in areas irrigated by tanks and wells (other than tubewells which may also be affected by interruption in power supply), may result in wide fluctuations in output.[5]

Since the new technology can affect production variability through variability of yield per unit of area, a comparison may be made of variability of yield before and after the adoption of the new technology. As the new technology came to be widely adopted in the State only from 1970-71, the situation after 1970-71 may be compared with that prevailing between 1960-61 and 1970-71. The following table indicates the standard deviation and the co-efficient of variation for foodgrains as a whole and for its constituents, rice; jowar; bajra; ragi; other cereals; and pulses for the two periods 1960-61 to 1970-71 and 1970-71 to 1980-81.

Table III: Standard Deviation and Co-efficient of Variation of Production and Productivity, 1960-61 to 1970-71 and 1970-71 to 1980-81

	Standard Deviation				Co-efficient of Variation			
	Production		Productivity		Production		Productivity	
	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81	1960-61 to 1970-71	1970-71 to 1980-81
Rice	7.78	13.89	11.05	6.72	9.94	13.71	13.87	6.63
Jowar	7.66	21.74	5.37	16.72	13.55	20.04	5.22	14.62
Bajra	7.45	23.74	5.64	25.24	7.87	22.59	5.70	20.97
Ragi	7.03	18.16	5.90	13.16	7.34	17.24	6.97	12.16
Other Cereals	7.20	16.57	3.36	13.86	7.50	21.84	3.59	15.87
Pulses	5.81	25.04	2.62	11.54	6.99	18.94	2.75	10.13
Total Foodgrains	6.41	12.94	5.54	8.16	7.67	12.73	6.49	7.88

Source: Basic data from Season and Crop Reports (Various Issues) Government of Tamil Nadu.

The standard deviation which is a measure of absolute variations, increases in respect of production in the second period compared with the first for foodgrains as a whole as well as for its components. However, in respect of productivity, while the standard deviation in respect of foodgrains as a whole has risen in the second period compared with the first, it has not been so in respect of rice. For rice, the standard deviation in the second period when the adoption of the new technology gathered momentum has been less than in the first. In respect of co-efficient of variation also, this has been the case; the co-efficient of variation of productivity for rice being less in the second period than in the first. Rice, therefore, has been an exception to the general tendency for the new technology to reinforce the variations in production brought about by the weather-induced factor. The decline in variability of rice productivity in the second period has to be ascribed to the increase in gross irrigated acreage. Between 1960-70 and 1979-80, the gross irrigated acreage under paddy increased from 23.2 lakh hectares to 27.1 lakh hectares, representing an increase of 16.8 per cent.

In respect of coarse cereals, both the standard deviation and the co-efficient of variation for production and productivity have been higher in the second period than in the first. The standard deviation as well as the co-efficient of variation for production and productivity in the second period have been, highest in respect of bajra, whereas they have been of a lower order of magnitude in respect of ragi (vide Table III). This is to be expected, since among the coarse cereals, the irrigated area is the lowest in respect of bajra and highest in respect of ragi (vide Chapter IV). Compared to rice, the irrigated area in respect of coarse cereals has also been declining.

Since coarse cereals are parexcellence rainfed crops, dependence on rainfall has been the major source of fluctuation in yield and consequently in production. It also introduces a major element of risk in coarse cereal farming. What matters is not just the total amount of rainfall but how well it is distributed over the different phases of growth.[6/]

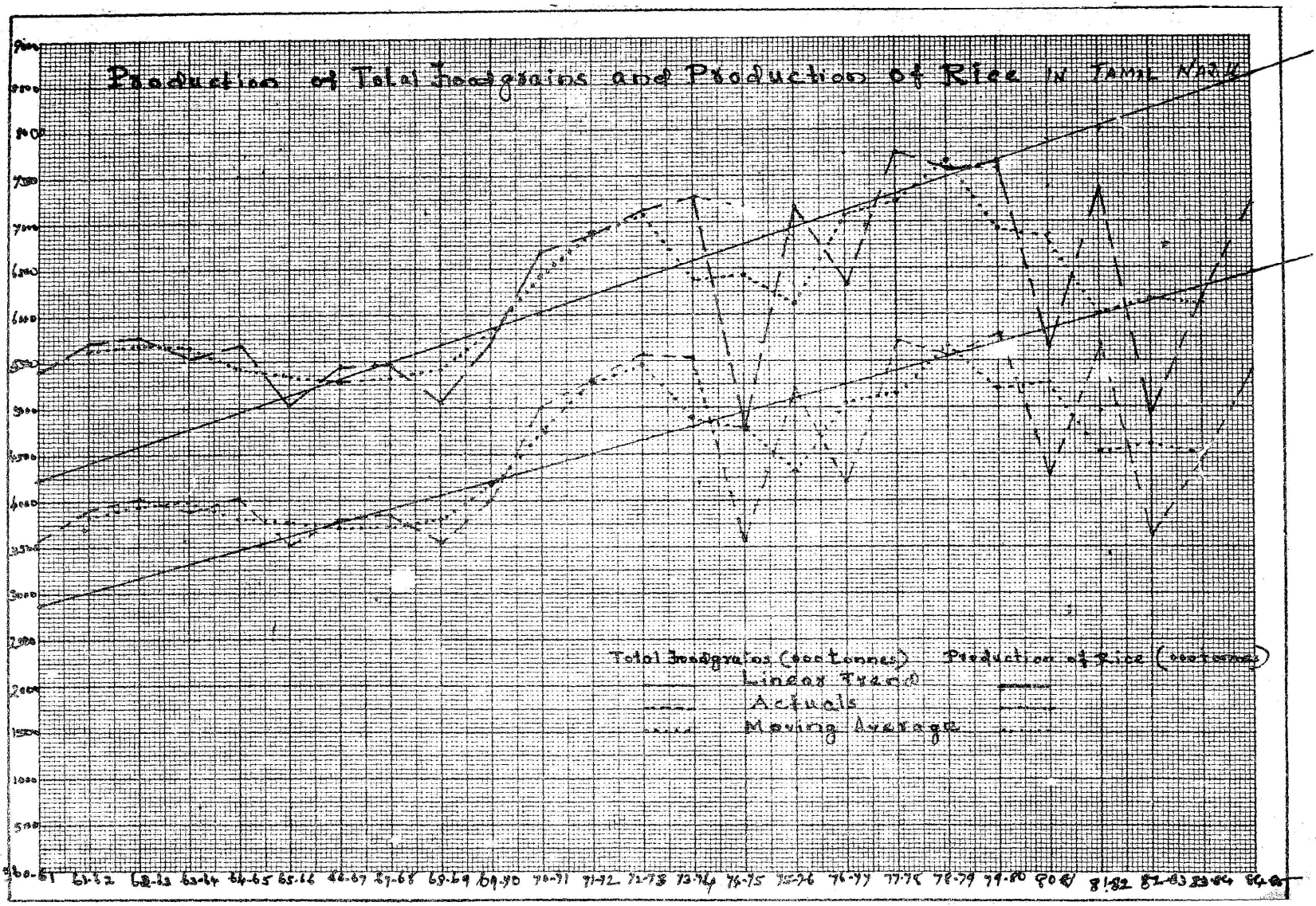
The adoption of the new technology although much slower than in respect of rice, has also contributed to the greater instability in productivity of coarse cereals in the second period as the high yielding varieties are subject to pests and diseases to a greater degree than local varieties. A study by ICRISAT indicates that the diffusion of jowar and bajra hyprids are "positively associated with, if not partially responsible for increased production instability in the major growing districts in India".[7/]

The standard deviation for production in respect of pulses in the second period has been much higher than in respect of cereals. The insignificant proportion of irrigated area under pulses accounts for this higher degree of absolute variation. With regard to productivity, the co-efficient of variation has been about four times as much in the second period as in the first (vide Table III).

5. Trend in foodgrain production

Chart II indicates (a) the fluctuations in foodgrains production from 1960-61 to 1984-85 and (b) the fluctuations in rice production during the same period. The Chart also indicates the three year moving average (to smooth out the year to year fluctuations) and the linear trend. It will be seen that while the trend of production has no

CHART II


Production of Total Foodgrains and Production of Rice in Tamil Nadu
Total Foodgrains (000 tonnes)
Production of Rice (000 tonnes)
Linear Trend
Actuals
Moving Average
9000
8000
7000
6000
5000
4000
3000
2000
1000
61-62
62-63
63-64
64-65
65-66
66-67
67-68
68-69
69-70
70-71
71-72
72-73
73-74
74-75
75-76
76-77
77-78
78-79
79-80
80-81
81-82
82-83
83-84
84-85

doubt been upward, year to year fluctuations have impeded sustained growth.

6. Reducing fluctuations in foodgrain production

Weather induced fluctuations in foodgrain production are unavoidable in our agricultural system, based mainly on rainfall. What can be done is to reduce the amplitude of such fluctuations. On the one hand, efforts should be made to build up the data and information which will help to improve the reliability of weather forecasting to enable the farmer to plan his cultivation schedules. It is also necessary to evolve short duration paddy such as IR 50 (having a duration of less than 105 days) which although having a lower return than long duration varieties, do not wither away and yield no return due to prolonged failure of rains.

The amplitude of fluctuations associated with the new technology, can be tempered by increasing the area under assured irrigation. In the context of irrigation facilities in the State, this can take the form of tank improvement and modernization which could help to reduce losses, stabilize existing irrigation as well as extend irrigation to new areas. Considering that 22.5 per cent of gross area irrigated is accounted for by tanks, modernization of tanks should have a high priority in the development programmes of the State as it would enable the utilization of an already created irrigation potential with greater efficiency.

7. Minimising the impact of production variations

For protecting the farmers against loss due to downward fluctuations in production resulting from natural hazards such as drought, floods and plant pests and diseases,

a comprehensive crop insurance scheme has been introduced from 1985 kharif season covering rice, wheat, coarse cereals and pulses. The growers of these crops are eligible for insurance to the extent of 150 per cent of crop loans extended by co-operative credit institutions, commercial banks and regional rural banks. Thus insurance is built in as a part of the crop loan for raising crops in areas to which the same is extended. The insurance premium is two per cent of the sum insured for cereal crops and one per cent for pulses and oil seeds. The premium payable by small and marginal farmers would be subsidised to the extent of 50 per cent. The premium is added to the crop loan sanctioned to the farmers intending to obtain insurance cover. The scheme is area-based and if the actual average yield per hectare of the insured crops for the defined area falls short of the "threshold" yield (taken to be 80 per cent of the five year average yield of the defined area), all the insured farmers growing that crop in that area, would be deemed to have suffered shortfall in yield and would be compensated.

As foodgrain farming in rainfed areas is subjected to a high degree of risk, crop insurance could help farmers in these areas to resort to new technology and use of purchased inputs with some degree of confidence. It has been pointed out that "the combination of crop insurance and minimum support prices can play a powerful stabilizing role in Indian agriculture."[8]

For protecting consumers against sharp fluctuations in prices due to adverse impact on availability arising from decline in production, an adequate buffer stock has to be built up which can be released to increase availability during a bad season. In fact, "the creation of a reasonably adequate buffer stock is of vital importance for evening out

fluctuations in availability and consequently in prices from one season to another", as has been pointed out by the Foodgrains Policy Committee, 1966.[9] The need to ensure food security by building up buffer stocks through procurement is discussed in Chapter VIII.

Annexure

Table I: Area, Production, and Productivity of Foodgrains in the State

Area: 000 hectares
Production: 000 tons
Productivity: Kg per hectare

Year	Area	Production	Productivity
1960-61	5101	5395	1057
1961-62	5097	5703	1189
1962-63	5122	5788	1130
1963-64	5027	5544	1103
1964-65	5083	5692	1120
1965-66	4866	5032	1034
1966-67	5083	5458	1074
1967-68	5007	5459	1090
1968-69	4709	5062	1075
1969-70	5015	5730	1143
1970-71	5109	6706	1313
1971-72	5161	6884	1333
1972-73	5282	7136	1351
1973-74	5065	7299	1441
1974-75	4403	4797	1089
1975-76	5068	7184	1418
1976-77	4906	6336	1291
1977-78	5302	7750	1462
1978-79	5155	7597	1474
1979-80	5253	7641	1455
1980-81	4247	5651	1331
1981-82	4662	7376	1582
1982-83	3929	4975	1266
1983-84	4679	6261	1338
1984-85	4975	7171	1442

Source: Season & Crop Reports and Tamil Nadu - An Economic Appraisal (various issues)

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CHAPTER VII

CONSUMPTION PATTERN

1. Percapita net availability of cereals

Before analysing the structure of consumption, it would be useful to assess the percapita net availability of cereals over time. Percapita net availability of cereals in the State is arrived at by taking into account net production, contribution to the central pool and receipts from the central pool, inter-state movement by rail and changes in stock held by the State Government. It may be mentioned that movement by road and stocks held by traders have been left out due to paucity of data. Table I indicates percapita net availability of cereals in the State from 1970-71 to 1981-82.

It will be seen that percapita net availability has witnessed wide variations from year to year depending on annual production. When production declined sharply in 1974-75, percapita net availability was reduced to 97.4 kg from the level of 154.5 kg in 1971-72. Similarly, percapita net availability declined to 114.8 kg in 1980-81 from the peak level of 167.7 kg in 1977-78, consequent on the marked decline in production in 1980-81.

To smooth out year to year variations, a three-year average has been taken which is indicated in Table II. For purposes of comparison, the per capita net availability of cereals at the all-India level has also been indicated.

Table I : Per Capita Net Availability of Cereals per Year in Tamil Nadu

Year	Gross Production (000 tons)	Net Production[1] (000 tons)	Receipts from Central Pool (000 tons)	Inter-State movement by rail[2] (000 tons)	Changes in stock held by State Govt. (000 tons)	Total Net Availability (000 tons)	Population (Mid Year) (000)	Percapita Net Availability[3] (in kg.)
	1	2	3	4	5	6	7	8
1970-71	6,573	5,751	286	+ 55	9	6,101	40,450	150.8
1971-72	6,687	5,851	364	+102	81	6,398	41,404	154.5
1972-73	6,939	6,072	379	- 82	62	6,431	42,233	152.3
1973-74	7,094	6,207	181	- 36	60	6,412	43,056	148.9
1974-75	4,682	4,097	120	+ 23	52	4,272	43,867	97.4
1975-76	7,057	6,175	809	+ 36	261	7,281	44,657	162.7
1976-77	6,160	5,390	559	+106	85	6,140	45,420	135.2
1977-78	7,554	6,610	508	+468	148	7,734	46,150	167.6
1978-79	7,379	6,457	452	NA[4]	233	7,142	46,537	152.5
1979-80	7,446	6,515	408	NA	241	7,164	47,473	150.9
1980-81	5,475	4,791	710	NA	16	5,517	48,051	114.8
1981-82	7,188	6,290	591	NA	136	7,017	48,868	143.6

1/ Net production is gross production minus allowance for seed, feed and wastage which is conventionally estimated to be 12.5 per cent of gross production.

2/ Net imports^{+} and Net Exports^{-}

3/ Column 6 ÷ Column 7

4/ NA (Not available)

Table II: Percapita net availability of cereals per annum (kg)

Year (triennium ending with)	Percapita net availability in the State	Percapita net availability at all-India level
1972-73	152.5	148.2
1975-76	136.5	140.0
1978-79	151.7	150.9
1981-82	136.4	147.4

Neither at the State level nor at the all-India level has there been a sustained increase in percapita net availability. On the contrary, percapita net availability at the State level has shown a decline from the level touched in 1972-73. To ensure a sustained increase in percapita net availability, it is essential:

(a) to reduce the amplitude of fluctuations in production (this has been dealt with in Chapter VI), and

(b) to achieve a rate of increase in cereal production significantly above the population growth rate instead of just keeping pace with the latter.

2. Level and Structure of Consumption

Percapita net availability is not equivalent to actual consumption which depends on effective demand or purchasing power. Data on actual consumption levels are available from the N.S.S. consumer expenditure surveys conducted periodically. Table III gives percapita monthly consumption of cereals in rural and urban areas of the State in 1961-62, 1973-74 and 1977-78:

Table III: Percapita monthly consumption of cereals in Tamil Nadu (in kg)

Rural areas

Commodity	1961-62 [1]	1973-74 [2]	1977-78 [3]
Rice	11.15	10.53	8.77
Wheat	0.11	0.88	0.11
Jowar	1.24	1.14	1.39
Bajra	0.76	0.98	1.21
Maize	0.27	0.02	-
Ragi	1.73	1.76	1.62
Small Millets	0.44	0.21	0.19
Total cereals	15.70	14.72	13.29

Urban areas

Commodity	1961-62	1973-74	1977-78
Rice	11.57	10.56	9.75
Wheat	0.27	0.20	0.66
Jowar	0.51	0.17	0.20
Bajra	0.04	0.10	0.16
Ragi	0.29	0.34	0.28
Small millets	0.09	0.01	0.01
Total cereals	12.77	11.39	11.06

1/ 17th Round, NSS (1961-62)

2/ 28th Round, NSS (1973-74)

3/ State Sample of the National Sample Survey (1977-78)

The percapita monthly consumption of cereals as revealed by N.S.S data from 1973-74 and 1977-78 converted to an annual basis is higher than the percapita net availability of cereals per annum derived from official estimates of production. The divergence has been ascribed to NSS estimates of foodgrains being subject to "rather large non-sampling errors".[1/] However, the trend in consumption in both estimates has been the same.

The monthly percapita consumption of cereals in the rural areas of the State has declined from 15.7 kg in 1961-62 to 14.7 kg in 1973-74 and to 13.3 kg in 1977-78 or a decrease of 6.3 per cent and 9.7 per cent respectively. In the urban areas of the State, a smmilar tendency has been discernible. Percapita monthly consumption has declined from 12.8 kg in 1961-62 to 11.4 kg in 1973-74 and to 11.1 kg in 1977-78 or a decline of 10.8 per cent and 2.8 per cent respectively. While the level of cereal consumption both in rural and urban areas has declined since 1961-62, the consumption level in the rural areas has been higher than that in the urban areas.

Since rice is predominant in cereal consumption, the behaviour of rice consumption is specially important. Percapita monthly consumption of rice in the rural areas has declined from 11.2 kg in 1961-62 to 10.5 kg in 1973-74 and to 8.8 kg in 1977-78 representing a decline of 5.6 per cent and 16.7 per cent respectively. In the urban areas, percapita monthly consumption of rice has declined from 11.6 kg in 1961-62 to 10.6 kg in 1973-74 and to 9.8 kg in 1977-78, representing an order of decline of 8.7 per cent and 7.7 per cent respectively. It may be noted that the decline in consumption between 1973-74 and 1977-78 has been much sharper in rural areas than in urban areas.

As regards coarse grains (jowar, bajra, maize, ragi, and small millets), the other important components of cereal consumption, no tendency towards decline in percapita consumption in rural areas has been noticeable. The level of consumption has been 4.4 kg in 1961-62, 4.1 kg in 1973-74 and 4.4 kg in 1977-78, indicating almost a uniform level of consumption. In fact, the consumption of coarse grains by the lower income groups has gone up; thus the consumption of the bottom quartile of the expenditure groups in rural areas increased from 4.8 kg per capita per month in 1961-62 to 5.2 kg per capita per month in 1977-78.

In contrast to the level of consumption of coarse cereals in the rural areas, the level of consumption of coarse cereals in the urban areas has been distinctly low. Besides being low, there has been a decline in consumption over the years. From 0.9 kg in 1961-62, consumption of coarse grains has declined to 0.6 kg in 1973-74 in urban areas.

3. Determinants of Consumption

The main determinants of consumption are the level of prices and income. Since the N.S.S. consumer expenditure surveys provide data on both quantity and expenditure in rupees, the retail price per kg can be calculated. The following table indicates the level of cereal prices in 1961-62, 1973-74 and 1977-78 in rural and urban areas of the State.

Table IV: Retail prices of cereals per kilo (in Rs)

	1961-62	1973-74	1977-78
Rural areas	0.57	1.41	1.63
Urban areas	0.66	1.65	1.87

The rise in cereal prices in the rural areas between 1961-62 and 1973-74 has been of the order of 147 per cent. With the impact of the seed-fertiliser technology in production (adopted intensively from the beginning of the seventies), the order of price increase slowed down to 16 per cent between 1973-74 and 1977-78. A similar development has been noticeable in the urban areas; the order of price increase being 50 per cent and 13 per cent respectively. The slower increase in price level in the urban areas between 1973-74 and 1977-78 may also be attributed to the moderating influence on prices exerted by the public distribution system which has been largely urban-oriented.

To assess the influence of incomes, the behaviour of agricultural and non-agricultural incomes has been considered separately. Agricultural income represented by Net State Domestic Product at constant 1960-61 prices accruing from the agricultural sector, slightly declined between 1960-61 and 1969-70 (1969-70 has been taken rather than 1973-74 because of comparatibility, since 1969-70 SDP is expressed in 1960-61 prices).[2/] Between 1973-74 and 1977-78. Net State Domestic Product at constant 1970-71 prices accruing from the agricultural sector increased at the compound rate of 1.5 per cent. Thus the marked rise in prices combined with sluggish growth in agricultural income have been responsible for decline in cereal consumption in rural areas.

Non-agricultural Net State Domestic Product grew by 4.8 per cent (compound) between 1960-61 and 1969-70 and by 5.4 per cent (compound) between 1973-74 and 1977-78. Thus in the urban areas, the price effect on cereal consumption has been more important than the income-effect.

It should also be noted that there has been a reduction in the proportion of expenditure on cereals to total consumer expenditure as can be seen from Table below:

Table V: Proportion of Expenditure on Cereals to Total Consumer Expenditure

(in per cent)

	1961-62	1973-74	1977-78
Rural	41.3	43.6	37.5
Urban	30.0	29.1	25.5

Both in rural and urban areas, there has been a decline in the proportion of expenditure on cereals to total consumer expenditure (the decline in rural areas has been visible only after 1973-74), indicating the diminishing role of cereals with increasing expenditure on consumption. The level of percapita monthly expenditure at which expenditure on cereals begins to decline may be seen from the following Table which gives the expenditure class, total expenditure on cereals, total consumer expenditure and percentage of cereal expenditure to total expenditure in rural and urban areas of the State according to the data collected through the State sample of the National Sample Survey in the 32nd Round 1977-78.

Table VI
Expenpiture on Cereals by Expenditure Groups.

Rural Areas

Expenditure class monthly per capita (Rs)	Total expenditure on cereals (Rs)	Total consumer expenditure (Rs)	Proportion of expenditure on cereals to total consumer expenditure (per cent)
0-10	1.78	6.00	29.7
10-20	8.92	17.42	51.2
20-30	13.38	26.33	50.8
30-40	17.07	35.23	48.5
40-50	20.65	45.40	45.5
50-75	24.00	60.52	39.7
75-100	26.95	85.39	31.6
100-150	30.62	118.73	25.8
150-200	34.37	179.89	19.1
200 and above	39.89	370.18	10.8
All classes	21.60	57.56	37.5

Urban Areas

0-10	-	8.85	-
10-20	7.99	16.36	48.8
20-30	12.60	26.52	47.5
30-40	15.86	35.68	44.5
40-50	18.14	45.23	40.1
50-75	20.56	61.45	33.5
75-100	22.51	85.95	26.2
150-200	23.83	171.30	13.9
200 & above	22.46	305.47	7.4
All classes	20.67	80.98	25.5

Source: State Sample of the NSS; 32nd Round, 1977-78.

In the rural areas, a perceptible decline in expenditure on cereals takes place from the expenditure group Rs 50-75 whose proportion of expenditure on cereals to total consumer expenditure has been approximately 40 per cent. The proportion declines to 26 per cent for the expenditure group Rs.100-150 and for the expenditure group Rs.200 and above, it is only 11 per cent. Similarly in the urban area a noticeable decline in expenditure on cereals takes place from the Rs.50-75 expenditure group. For this expenditure group, the proportion of expenditure on cereals to total consumer expenditure has been 34 per cent. It declines to 20 per cent for the expenditure group Rs.100-150 and to 7 per cent for the expenditure group Rs.200 and above.

Decreasing expenditure on cereals with increasing expenditure on consumption is a universal phenomenon indicating that beyond a certain level of expenditure, people would prefer to diversify their expenditure on consumption. Infact, the proportion of expenditure on non-cereals to total expenditure on food has increased from 38.6 per cent in 1960-61 to 51.3 per cent in 1977-78. The expenditure elasticity for cereals derived from the N.S.S. data on consumer expenditure for 1973-74 (28th Round) works out to

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0.45 for the bottom quartile in the rural areas and 0.29 for the bottom quartile in the urban areas. For all consumers in the rural areas, the elasticity works out to 0.21 and in the urban areas 0.06. This indicates that a 10 percent increase in income (expenditure being a proxy for income), would result in about 5 per cent increase in expenditure on cereals on the part of the lower income groups in the rural areas and about 3 per cent increase on the part of the lower income groups in the urban areas.

4. Structure of Consumption

The structure of consumption of cereals is indicated by the proportion of the component elements to total consumption of cereals. This can be derived from Table III which indicates percapita monthly consumption of cereals (in kg) in rural and urban areas for the years 1961-62, 1973-74 and 1977-78. The proportion of monthly consumption of the components of cereals is indicated in Table VII.

The dominant position of rice in the consumption of cereals in the rural and urban areas is evident from the Table VII. The dominance is more marked in the urban than in the rural area. However, this dominance has declined since 1973-74. The proportion of rice in total cereal consumption in the urban area has declined from 92.7 per cent in 1973-74 to 88.2 per cent in 1977-78 while in the rural area, the decline has been from 71.5 per cent to 66.0 per cent.

Coarse grains (jowar, bajra, ragi and small millets) form a significant proportion of cereal consumption in the rural areas. In fact, in rural areas, the consumption of

Table VII: Proportion of monthly consumption per person of components of cereals (in per cent)

Rural Areas

Commodity	1961-62	1973-74	1977-78
Rice	71.0	71.5	66.0
Wheat	0.7	0.5	0.8
Jowar	7.9	7.7	10.5
Bajra	4.8	6.7	9.1
Maize	1.7	0.1	-
Ragi	11.0	12.0	12.2
Small millets	2.9	1.5	1.4
	100	100	100

Urban Areas

Commodity	1961-62	1973-74	1977-78
Rice	90.6	92.7	88.2
Wheat	2.1	1.8	6.0
Jowar	4.0	1.5	1.8
Bajra	0.3	0.9	1.4
Ragi	2.3	3.0	2.5
Small millets	0.7	0.1	0.1
	100	100	100

Source: Basic data from 17th, 28th and 32nd Rounds of the NSS.

coarse grains has increased from 28.2 per cent of total cereal consumption in 1961-62 to 33.2 per cent in 1977-78. On the other hand, in the urban area, since coarse grains are regarded as "inferior good", the proportion to total cereal consumption is low, 5.8 per cent in 1977-78. With progressive urbanization, there has indeed been a decline in coarse grain consumption from 7.3 per cent in 1961-62 to 5.8 per cent in 1977-78.

Of the coarse grains consumed in the rural areas, ragi is the principal grain followed by jowar and bajra. The proportion of ragi in total consumption of coarse cereals has been 37 per cent, jowar 32 per cent, and bajra 27 per cent in 1977-78.

A significant development in cereal consumption in urban areas has been the increasing consumption of wheat. While the consumption of wheat in urban areas accounted for only 2.1 per cent of cereal consumption in 1961-62, in 1977-78, it accounted for 6.0 per cent, a three fold increase. This development may be ascribed to the larger quantities of wheat being issued over the years through the public distribution system and to the urban consumer preference for bread.

The expenditure elasticity of demand for components of cereals (rice and / coarse grains) in rural and / urban areas and for all consumers calculated from the N.S.S. data on consumer expenditure for 1961-62 and 1973-74 is indicated below:

Table VIII: Expenditure elasticity of demand

Commodity	1961-62		1973-74	
Rice	Bottom quartile	All consumers	Bottom quartile	All consumers
Rural	1.11	0.38	1.51	0.53
Urban	0.74	0.14	-	0.54
Coarse grains				
Rural	0.46	0.13	0.26	-0.05
Urban	-	-	-0.40	-0.04

In respect of coarse grains, it is only in rural areas that the expenditure elasticity has been positive; in the urban areas even for the bottom quartile it has been negative. Thus increase in income in urban areas will tend to the substitution of "superior cereals" for coarse grains in consumption.

5. Magnitude of under-nutrition

Undernutrition signifies inadequate calorie intake. According to "The Fourth World Food Survey" by the Food and Agriculture Organization of the United Nations, "malnutrition refers to physical effects on the human body of diet intake inadequate both in quantity and quality; undernutrition refers to low food intake itself".[3] Data on energy or calorie intake by expenditure groups for 1971-72 are available from the Twenty Sixth Round (July 1971 - June 1972) of Consumer Expenditure Survey which was specially undertaken for FAO by N.S.S.[4] Average intake per day of calories in the rural and urban areas per consumer unit[5] by expenditure groups in the State is given below:

Table IX: Average intake of calories per day per consumer unit

Percapita monthly consumer expenditure Expenditure group (Rs)	Rural area	Urban area
00 - 15	1128	1024
15 - 21	1679	1374
21 - 24	1864	1654
24 - 28	2115	1714
28 - 34	2263	1889
34 - 43	2808	2137
43 - 55	3253	2401
55 - 75	4563	2750
75 - 100	4683	3288
100 & above	4265	3913
All Expenditure classes	2394	2239

Much of the calories are obtained from cereals. From the group of commodities comprising of cereals, potatoes, sugar, jaggery and cereal substitutes, the percentage of calories obtained is roughly 80 per cent. Hence the dominance of cereals in total calorie intake.

From Table IX, it can be seen that energy or calorie intake is greater in the rural pattern of food consumption than in the urban pattern. The principal factor accounting for this is that in the rural areas auto-consumption or production for self-consumption is more widely prevalent than in urban areas. It may also be noted that there is considerable distributional imbalance in calorie intake due to differences in income or purchasing power. Total

calorie intake increases from 1128 in the lowest expenditure class to 4683 in the expenditure class Rs 75-100 in the rural areas. The extent of undernutrition may be gauged by comparing the actual calorie intake with the requirement of calories per consumer unit. If the latter is taken to be 2700 per consumer unit or 2160 calories percapita per day, the percentage of households consuming less than this in the rural areas in the State in 1971-72 was 64 and in urban areas 68. From Table IX it can also be seen that for the expenditure groups upto Rs 28-34 in the rural areas and upto Rs 43-55 in the urban areas, the calorie intake has been less than the minimum requirement. Percapita monthly consumer expenditure has to rise above this level for minimum calorie intake to be attained.

No data have been available on calorie intake by consumer expenditure groups since 1971-72. However, energy intake (calorie intake) per capita per day is available for 1973-74 for rural and urban areas in the State. For purposes of comparison, the level of calorie intake for 1971-72 and 1973-74 in the other States is also indicated in Table X.

Usually in States, where cereal consumption is high, calorie intake is also high. However, in Gujarat and Punjab calorie intake is high though cereal consumption is moderate (156 kg. and 162 kg. respectively of cereals percapita in 1973-74) due to greater quantity of energy being derived from non-cereal items.

Table X: Energy intake (Kilocalorie) percapita perdiem in rural & urban areas for each State for the years 1971-72 and 1973-74[6]

State	Rural		Urban		Combined	
	1971-72	1973-74	1971-72	1973-74	1971-72	1973-74
Andhra Pradesh	2118	2209	2087	2121	2112	2192
Assam	2132	2105	2163	2031	2135	2098
Bihar	2178	2186	2249	2300	2185	2197
Gujarat	2295	2180	2122	2230	2246	2194
Haryana	2874	2971	2250	2244	2764	2843
Jammu & Kashmir	2793	2742	2267	2497	2695	2696
Karnataka	2254	2211	1912	1995	2171	2158
Kerala	1610	1534	1658	1760	1618	1571
Madhya Pradesh	2852	2422	2289	2108	2760	2371
Maharashtra	2033	2044	2041	2163	2035	2081
Orissa	2017	2125	2213	2164	2033	2128
Punjab	2954	2818	2270	2355	2792	2708
Rajasthan	2586	2719	2393	2243	2552	2635
Tamil Nadu	1910	2012	1797	2092	1876	2036
Uttar Pradesh	2407	2450	2101	2046	2364	2393
West Bengal	1860	2070	2015	2196	1898	2101

Source: Sarvekshana Vol II No 1, July 1978.

The level of calorie intake has witnessed an improvement between 1971-72 and 1973-74 in the State. It has increased from 1876 percapita per day in 1971-72 to 2036 in 1973-74. But still it has been below the recommended calorie intake of 2200. There appears to have been a deterioration in calorie intake in 1977-80 according to the food balance data prepared by the State Department of Statistics.[7] This indicates an availability percapita per day of 1966 kilocalories which falls short of the minimum

recommended by 10.6 per cent.

6. Overcoming deficiency in calorie intake:

Under-nutrition or deficiency in calorie intake has to be overcome by approaching from two fronts. The first is increased production of all food items particularly cereals. It was mentioned earlier that where cereal consumption is higher, the calorie intake also tends to be higher. The association between the level of cereal consumption and calorie intake is indicated in the following table which gives the percapita per year consumption of cereals in each State in 1973-74 and the level of calorie intake.[8/]

Table XI: Percapita per year consumption of cereals (kg.) and energy (calorie) intake per capita: 1973-74

State	Consumption of cereals percapita per year (kg.)	Energy intake percapita
Andhra Pradesh	184	2192
Assam	180	2098
Bihar	178	2197
Gujarat	156	2194
Haryana	190	2843
Jammu & Kashmir	218	2696
Karnataka	175	2158
Kerala	93	1571
Madhya Pradesh	196	2371
Maharashtra	146	2081
Orissa	188	2128
Punjab	162	2708
Rajasthan	213	2635
Tamil Nadu	165	2036
Uttar Pradesh	189	2393
West Bengal	150	2101
All-India.	172	2263

As has been mentioned already, in Gujarat and Punjab calorie intake is high even though cereal consumption is moderate as a relatively larger quantity of energy is derived from non-cereal sources.

The average per capita net availability of cereals in the State (for the years 1977-78, 1978-79 and 1979-80) declined to 151.7 kg. (vide Table I) and consequently the energy intake per capita also declined compared to the intake in 1973-74. In neither years has the level of energy intake met the required minimum. Sustained higher level of cereal production is, therefore, an essential prerequisite for overcoming the deficiency in calorie intake in the State.

Under-nutrition is related not only to the level of food availability but also to income level or 'the entitlement'[9] to sufficient resources to purchase enough food to live. It is the agricultural labourers, the marginal farmers and the artisans in the rural areas who are suffering from 'entitlement failure' or 'failure to secure enough food through production, exchange, transfer or some combination of this'[10]. The number of agricultural labourers in the State has increased by about 32 per cent between 1971 and 1981. The area of operational holdings below 1 ha (operated by marginal farmers) has increased from 17 per cent of the total area of operational holdings in 1970-71 to 21 per cent in 1976-77.[11] Thus the number of persons suffering from 'entitlement failure' has been increasing in the State.

Besides the public distribution of food grains (dealt with in Chapter VIII), there should be programmes to provide the disadvantaged groups with employment and purchasing power. It is not only necessary to ensure a regular supply of grains in kind for the labourers who are offered

employment but also the employment generating schemes should help in building up community assets (such as minor irrigation, soil conservation and social forestry).

It is in this context of deficiency of calorie intake that the Nutritious Noon Meal Programme of the Government introduced in 1982 assumes significance. It now (1985-86) reaches over 86 lakh school and pre-school children, besides two lakh adults belonging to the socially and economically vulnerable groups such as the aged, the physically handicapped, destitute widows and ex-servicemen pensioners. The scheme seeks to simultaneously attack hunger, under-nutrition and illiteracy and as such is characterized by a multi-pronged approach.

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CHAPTER VIII

Public Intervention in the Foodgrain Economy

1. Rationale of public intervention

Public intervention in the foodgrain economy was necessitated by the scarcity conditions which developed with the outbreak of the Second World War in September 1939. It was accentuated by the fall of Burma in 1942 leading to the cutting off of one of main sources of food supply of the country. To meet the situation, controls in the form of price control, procurement, rationing or controlled distribution, had to be imposed by the Government. Barring the two shortlived attempts at food decontrol in 1947 and 1953-54, public intervention in the foodgrain economy has continued to this day though the objectives and modus operandi have undergone significant changes over the years. Thus India has had more than four decades of experience in public intervention in the foodgrain economy. 1/

The rationale of public intervention in the foodgrain economy is the recognition that in such a vital commodity as foodgrain, free market forces, if left to themselves, especially in a situation of overall shortages, would create destabilizing effects through speculative activities which benefit neither the producer nor the consumer. Nor can government's specific welfare objectives such as meeting the consumption needs of vulnerable sections of the population be achieved by the market mechanism. Intervention, however, does not dispense with the market altogether. As it has evolved and as it is prevailing at present in the country, government intervention has created a "two-market two-price regime", an open market and a government run, concessional food supply system.

2. Changing emphasis on role of public intervention in the foodgrain economy

Initially, the objective of public intervention in the foodgrain economy was to protect the urban consumer from sharp rises in foodgrain prices. The mechanism by which this was to be effected was laid down as early as 1943 by the Foodgrain Policy Committee (1943), known as the Gregory Committee, the first of a series of food policy Committees appointed by the Government of India. The essentials of public intervention conceived by the Committee cover increase in available supplies through increase in production and intensive procurement in surplus areas; equitable distribution through rationing; a check on rising prices through statutory price control, and establishment of a central foodgrains reserve to be "used for one main purpose and one only; to convince speculators and profiteers, whether in or out of trade, that the Government of India is in a position to break any ring which may be formed against it".[2/] The recommendations of the Committee provided the guidelines of policy in subsequent years. Safe-guarding of the interests of the consumer continued to be the dominant motive of public intervention till about the mid-sixties.

The adoption of the new technology in agriculture (seed-fertilizer technology) from the mid-sixties and its impact on production, helped to alleviate the problem of scarcity of foodgrains. At the same time, ensuring the producers reasonable prices with an adequate incentive for increasing production became a major concern of policy. This was reflected in the setting up of the Agricultural Prices Commission (APC) in 1965 to advise the Government of India on the price policy for agricultural commodities

"with a view to evolving a balanced and integrated price structure in the perspective of the overall needs of the economy and with due regard to the interest of the producer and consumer".[3] The procurement/support prices* which the APC has been recommending since 1965-66 take into account the trends in market prices, demand and supply situation, the latest available estimates of cost of production and rise in prices of input since the completion of cost studies. When the terms of reference of APC were revised in March 1980, the Commission was enjoined to keep in view the terms of trade between agricultural and non-agricultural sectors as well, in making its recommendations on price policy. The Commission has now been designated as Commission for Agricultural Costs and Prices. It should be remembered that the APC only makes recommendations; the procurement/support price is announced by the Government of India. And there have been occasions when there has been a divergence between the two, the announced price being invariably higher than the recommended one.[4] There is, therefore, a feeling that the pendulum has now swung to the other direction (in the direction of the producers).

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* Theoritically, there is a distinction between support price and procurement price. The support price is the minimum below which prices are not to be allowed to fall while procurement price may rule above this level. At the support price, the government offers to buy all that is offered by the producer. The procurement price which is higher than the support price, is offered to induce the producer to part with some of his surplus. In actual price, this distinction has been blurred. At present, the government buys whatever quantities are offered at the procurement price.

The implementation of the policy of procurement/ support price was facilitated by the establishment of the Food Corporation of India (FCI) in 1965, the same year in which APC was set up. The FCI was set up with the function of undertaking the purchase, storage, movement, transport and distribution and sale of foodgrains and other food stuffs. It thus became the operational arm of the Government for enforcing the procurement/support price policy. The emergence of large surpluses in concentrated areas (Punjab, Haryana, Western Uttar Pradesh and Andhra Pradesh) due to the wider adoption of the new technology in agriculture forced the FCI to undertake large purchases under price support in the early seventies. Even when procurement is effected by a State Civil Supplies Corporation or a State Co-operative Marketing Organization, the purchases except possibly in poor crop years, have largely served as a measure of price support.

Even the objective of protection of the consumer from undue rise in foodgrain prices gave place to a concern for the protection of the vulnerable sections of consumers. In the early fifties, the rationing form of curbing demand and thus keeping prices in check gave way to "fair price shop" (FPS) system where the objective became that of lowering open market prices through increased supplies (either by increase in production or increase in imports). Around 1967-68 the name of FPS scheme was changed in the Government policy documents to "Public Distribution System" (PDS). But it was much more than a change in nomenclature. The emphasis in public distribution of foodgrains came to be on making available foodgrains to the vulnerable sections of society at reasonable prices.

However, there has been no unanimity as to who constitute the vulnerable sections of the society. The difficulty has been in defining and identifying such sections of society. One of the criteria adopted is income; income earners below a certain level of income only (for rice, Rs. 1000 per month as in Tamil Nadu) being declared as entitled to the benefits of the public distribution system. Another criterion suggested is area. Thus the National Commission on Agriculture suggested that the coverage of the public distribution system should be (i) all cities and towns with population of over one hundred thousand, excluding those in surplus States; (ii) all industrial towns covered under the scheme of All India Consumer Price Index Numbers for industrial workers; (iii) drought prone areas on a regular basis; (iv) flood affected areas - for three months every year; and (v) all urban and rural workers in Jammu & Kashmir and Kerala.[5/] This demarcation of categories of people to be covered is predominently oriented to organised labour and urban population; only a minimum of rural population is expected to be covered. The economically vulnerable sections in the rural areas (comprising marginal farmers and landless labourers) have not received the same attention as organized labour in the demarcation of beneficiaries by the National Commission on Agriculture. That the PDS should cover the low income consumers both in urban and rural areas has only now been increasingly recognised.

To ensure reasonable prices to the consumer, Government intervenes by fixing the issue price which does not cover the full cost incurred by the FCI on procurement, movement, storage and distribution of foodgrains. Thus in 1978-79, when the procurement price announced by the Government of India for wheat was Rs. 115 per quintal, the issue price

fixed by the Govt. was Rs.130 per quintal, although procurement and distribution incidentals incurred by FCI was slightly over Rs.30 per quintal,[6] the difference between the full cost incurred and that added to procurement price, being subsidized by the Government. In a statement in the Lok Sabha, the Government mentioned that its (Union Govt.'s) subsidy to the Food Corporation has risen from Rs.600 crores in 1979-80 to Rs.650 crores in 1980-81 and Rs.700 crores in 1981-82 and that the subsidisation was "a deliberate social policy". The subsidy to the FCI includes not only the consumer subsidy but also reimbursement of the cost of carrying buffer stocks. By 1984-85, the two together had risen to Rs.855 crores.

Public distribution involving supply of foodgrains at prices below open market levels through fair price shops (which numbered 32.2 lakhs in October 1985 spread throughout the country) has helped to ensure a minimum food consumption to the low income ration-card-carrying population. It should be remembered that the population covered by the public distribution system can only be regarded as giving an idea of persons who are <u>eligible</u> to draw food grains from the public distribution system. Whether eligibility is translated into accessibility depends on income or purchasing power. What needs to be stressed, however, is that the system has created a "dual market", open market and fair price shops, since the consumer has the option to purchase either from the open market or from the fair price shop.

The need for a buffer stock to act as a cushion against moderate fluctuations in production as also to ensure price stability and curb upward pressure on prices was recognized as early as 1943 by the Foodgrains Policy Committee set up

in that year by the Govt. of India. Normally, inventory operations are undertaken by private trade to smooth out seasonal availability and variations in prices. But the record of private trade in this respect in India has been such that a buffer stock of foodgrains has to be built up by a public authority, as a policy measure, in the interest of the producer and the consumer. Initially, the buffer stock was built by imported grains. With the rapid strides made in foodgrain production consequent on the adoption of the new technology, it became possible to link the building up of buffer stocks to domestic production. The role of a buffer stock also came to be more fully understood, namely to "offset (buffer) production irregularities, by adding to private consumption availability (i.e. drawing down public stocks) during shortages and withdrawing from consumption availability (i.e., building up stocks) during relative abundance".[7] Procurement operations came to be dictated not only by the requirements of PDS but also by the need to build up buffer stocks of foodgrains. The size of the buffer stock suggested by various Foodgrain Policy Committees has varied. The Central Government has now decided to maintain a buffer stock of 10 million tons of foodgrains over and above the operational stocks ranging between 6.6 million tons and 11.4 million tons at different periods of the year, following the recommendation of a technical group headed by the Food Secretary, Mr. B. C. Gangopadhyaya, set up in 1981. With increase in procurement and lower off-take from fair price shops, the size of the buffer stock rose from 16.8 million tons on 1 July 1983 to 29.2 million tons on 1 July 1985, comprising roughly 20 million tons of wheat and 9 million tons of rice.

Thus over the years, public intervention in the foodgrain economy has crystalised around three major

objectives: 1) assuring a minimum support/procurement price to the producer to provide the incentive to adopt the new technology in production. 2) maintenance of a public distribution system for meeting the minimum foodgrain requirements of low income consumers, and 3) building up of a sizeable buffer stock to even out fluctuations in production as also to moderate marked variations in prices.

An idea of the size of Government operations involved in intervention in the foodgrain economy may be had from Table 1. It indicates from 1975 to 1985, net imports as a proportion of net availability of foodgrains; procurement as a proportion of net production of foodgrains; and public distribution as a proportion of net availability. It will be seen that imports have been eliminated (the country has become a net exporter); procurement has increased from 10.9 per cent to 15.6 per cent of net production of grains and that public distribution has slightly declined from 12.6 per cent to 11.1 per cent of net availability. In absolute terms, procurement has gone up from 9.6 million tons to 20.0 million tons and public distribution has increased from 11.3 million tons to 14.1 million tons over the period. This is a measure of the extent to which the "commanding heights" of the foodgrain economy have been attained through public intervention.

3. Objectives of intervention in the foodgrain economy in Tamil Nadu

As in the rest of the country, under conditions of short supply of foodgrains, government intervention in Tamil Nadu as well, has taken the form initially of price control, procurement by compulsory levies on producers/

Table :1

Net Availability, Procurement and Public Distribution of Foodgrains - All-India

Year	Net Production of Foodgrains (million tonns)	Net Imports (million tonns)	Net Availability of Foodgrains (million tonns)	Procurement (Million tonns)	Public Distribution (million tonns)	Col.3 as % of Col.4	Col.5 as % of Col.2	Col. 6 as % of Col.4
1	2	3	4	5	6	7	8	9
1975	87.35	7.54	89.33	9.56	11.25	8.4	10.9	12.6
1976	105.90	6.92	102.08	12.85	9.17	6.8	12.1	9.0
1977	97.27	0.49	99.39	9.94	11.74	0.5	10.2	11.8
1978	110.61	(-)0.63	110.22	11.09	10.18	(-)0.5	10.0	9.2
1979	115.41	(-)0.86	114.20	13.84	11.66	(-)0.8	12.0	10.2
1980	95.99	(-)0.35	101.42	11.17	14.99	(-)0.3	11.6	14.8
1981	113.39	0.45	114.08	12.94	13.01	0.4	11.4	11.4
1982	116.63	1.58	116.94	15.35	14.77	1.4	13.2	12.7
1983*	113.33	4.07	114.74	15.67	16.21	3.6	13.8	14.1
1984*	133.33	2.37	128.63	18.72	13.34	1.8	14.0	10.4
1985*	127.95	(-)0.32	126.96	20.00	14.07	(-)0.3	15.6	11.1

*Provisional .
Source: Economic Survey : Government of India 1985-86

millers/traders at prices fixed by the government, supported by zoning and movement restrictions and controlled distribution of foodgrains through rationing. With the improvement of the foodgrain supply position in the State from the mid-seventies, there has been a major change in the objectives of intervention. No longer has the emphasis been on price control per se but on providing a remunerative price to the paddy grower and purchasing his output as a measure of price support. Similarly, the public distribution system is to serve not only the urban consumers mainly, but to be extended to the people in the rural areas as well. Further, while the Government expressed its anxiety that the producers should get a remunerative price for paddy, it also emphasised as one of its primary responsibilities that the consumer must be ensured rice under the public distribution system at reasonable prices.

These changes in policy are reflected in the Policy Notes on the Food Situation in Tamil Nadu placed on the Table of the Legislative Assembly. In the Policy Note placed on the Table of the Legislative Assembly in April 1979, the Government stated that "ensuring a remunerative price to the producers and also assuring the consumer of availability under the public distribution system at reasonable prices should be the two basic principles of food policy". Again, in the Policy Note placed on the Table of the Legislative Assembly in July 1980, it was stated that "a reasonable price to the consumer and a remunerative return to the producer are the cornerstones of our policy".

That there is often a conflict between these two objectives was not explicitly recognised although measures were taken to reconcile the objectives by subsidising the consumer. The conflict between the objectives arises

because the level of producer prices has an important influence on the price of wage goods and hence affect the real income of low income consumers.

4. Instruments for implementing policy

In implementing the policy laid down, the instruments used have been procurement and public distribution of foodgrains. The responsibility for implementing the policy was entrusted to the Tamil Nadu Civil Supplies Corporation set up in 1972. The Corporation has been entrusted with the task of procurement operations; hulling of paddy; storing rice; and making allotments for public distribution. When the Central Government announced in 1977 that the whole country would be a single zone for purpose of rice movement, the responsibility for building a buffer stock by open market purchases in the State and other States was also entrusted to the Civil Supplies Corporation. Further, the allotment of foodgrains (rice and wheat) by the Central Government is also handled by the Tamil Nadu Civil Supplies Corporation.

5. Ensuring a remunerative price to the paddy grower

The objective of ensuring a remunerative price to the paddy grower is sought to be achieved by purchasing paddy/rice at the procurement/support price announced by the Government of India for the whole country on the recommendation of APC. Table below indicates the procurement/support price for common variety of paddy from 1975-76 to 1985-86 as announced by the Government of India and as fixed by the State Government.

Table II: Procurement/Support Prices for Common Variety of Paddy

(Rs. per quintal)

Year	Announced by Government of India	As fixed by the State Government	
1975-76	74.00	74.00	
1976-77	74.00	74.00	
1977-78	77.00	77.00	
1978-79	85.00	105.00	
1979-80	95.00	105.00	
1980-81	105.00	115.00	
1981-82	115.00	115.00	
1982-83	122.00	122.00	(+ Rs.15 per quintal in monopoly procurement areas)
1983-84	132.00	132.00	(+ Rs.35 per quintal in monopoly procurement areas)
1984-85	137.00	137.00	(+ Rs.35 per quintal in monopoly procurement areas)
1985-86	142.00	142.00	(+ Rs.35 per quintal in monopoly procurement areas)

During the period, the procurement/support price has gone up from Rs.74 per quintal to Rs.142 per quintal representing an increase of 92 per cent. Underlying the objective of ensuring a remunerative price to the grower is the need to provide an incentive to adopt the new technology which involves the use of purchased inputs compared to the traditional technology. In other words, the procurement/support price should cover the cost of production of the grower. Data on cost of production of paddy available from the Comprehensive Scheme for Studying the Cost of Cultivation/Production of Principal Crops in India are indicated below.

TABLE III: Cost of Production of Paddy
(Rs. per quintal)

	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Andhra Pradesh	78.98	85.97	87.09	88.36	93.12	105.56	112.47
Haryana	NA	NA	78.44	NA	100.68	NA	NA
Orissa	67.86	67.58	65.70	69.58	83.25	81.9	NA
Punjab	NA	NA	NA	68.71	NA	NA	102.31
Tamil Nadu	64.47	90.79	81.97	81.74	92.23	108.96	118.46
West Bengal	79.63	85.31	70.93	96.36	NA	NA	NA

Source: Comprehensive scheme for studying the cost of cultivation/production in India of principal crops: Indian Agriculture in Brief: Directorate of Economics and Statistics, Ministry of Agriculture: Government of India.

NA : Not available

A comparison of Table II and Table III reveals that in 1976-77 and 1977-78, the procurement/support price in Tamil Nadu was lower than the total cost of production.* In 1978-79 and 1979-80 the procurement/support price has been

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* Total cost comprises of (1) cash and kind expenses including the value of hired human labour, owned and hired bullock labour, owned and hired machine labour, seed (both farm produced and purchased), manure and fertiliser, insecticides and pesticides, depreciation, irrigation charges, land revenue cesses and other taxes, interest on working capital and rent for leased-in land, and (2) imputed rental value of owned land (less land revenue paid thereon), interest on owned fixed capital (excluding land) and value of family labour.

slightly higher than the total cost of production. A comparison of the cost of production of paddy in Tamil Nadu with other paddy producing States such as Andhra Pradesh, Orissa and West Bengal reveals that costs are relatively higher in Andhra Pradesh and Tamil Nadu (major rice producers) indicating higher level of input-use. An all-India uniform procurement/support price for paddy therefore does not reflect inter-regional variations in the level of input use. It is in this context, that the observation "since the risks involved in the adoption of high yielding varieties differ considerably from region to region for climatic reasons and on account of differences in the infra-structure, there is clearly a case for considering whether the support prices guaranteed to farmers through government intervention should not differ to some extent from region to region"[8] is relevant.

Of late, the terms of trade represented by the index of parity between prices received and paid by the farmer in the State has been turning against the farmer. The parity index (with base 1954-55=100) has been calculated at 64.5 in 1979, 68.2 in 1980, 75.9 in 1981 and 63.9 in 1982.[9] Although there has been a noticeable improvement in the parity index in 1980 and 1981, it worsened in 1982. Partly to compensate the farmer for this adverse development, the State Government has resorted to paying the farmer an "incentive bonus" over and above procurement/support price. Thus in 1978-79, when the Government of India announced the procurement price for coarse paddy at Rs. 85 per quintal, the Tamil Nadu Civil Supplies Corporation was directed to purchase coarse paddy at Rs.105 per quintal, representing an increase of Rs.20 per quintal. In 1979-80, this increased price (Rs.105 per quintal) was retained, when the procurement/support price had been revised by the Government of India to Rs.95 per quintal.

In 1980-81, the State Government fixed Rs.115 per quintal of common variety of paddy, when the Government of India revised the price for this variety of paddy to Rs.105 per quintal. No increase in the procurement/support price in 1981-82 was announced by the State Government as all the State Governments were informed by the Government of India that no bonus should be paid in addition to the procurement price and if this was not observed, the credit facilities from the Reserve Bank at low rates of interest for procurement would not be granted. For 1982-83, with monopoly procurement in Thanjavur district and in certain taluks in South Arcot and Tiruchirapalli districts and in consideration of the drought conditions in these areas, the Tamil Nadu Government decided to pay a drought allowance of Rs.15 per quintal over and above the purchase price in these areas. This was raised to Rs.35 per quintal over and above the procurement price in 1983. The additional amount is now being paid in kind (in the form of fertilizer and pesticides). The procurement/support prices at which the Tamil Nadu Civil Supplies Corporation was directed by the State Government to purchase paddy from producers are indicated in Table II.

7. Determinants of procurement

The volume of procurement is determined by (a) production (marketed surplus), (b) ratio of farm harvest price to procurement price, and (c) mode of procurement.

As regards (a) it is necessary to underline that the State is in a different position from that of Punjab and Andhra Pradesh. In Punjab, almost the entire production of rice is marketed as it is a commercial crop in that State. Market arrivals of rice as a percentage of production have been 98.1 in Punjab in 1977-78 compared with 39.6 in Tamil Nadu.[10/] Nor has Tamil Nadu a volume of production of rice

comparable to that of Andhra Pradesh which ranks first in the percentage share of State's in all-India production of rice.

The following Table indicates production, procurement and the proportion of procurement to production:

TABLE IV

Procurement and Production Rice (000 tons) and the Proportion of Procurement to Production

Year	Procurement (rice including paddy in terms of rice)	Production (rice)	% of procurement to production
1975/76	888	5203	17.1
1976/77	173	4215	4.1
1977/78	94	5705	1.6
1978/79	71	5559	1.3
1979/80	133	5800	2.3
1980/81	179	4279	4.2

Source: Bulletin on Food Statistics (successive issues): Directorate of Economics & Statistics. Ministry of Agriculture, Government of India. Procurement refers to marketing year October to November.

Two features of procurement emerge from the Table: (i) the low proportion of procurement to production which indicates that there has been no attempt to secure a commanding position in the food trade; and (ii) the "perverse relationship" between production and procurement, a larger quantity being procured in a bad year and vice versa in the

good year.* The first has been due, apart from the size of the marketed surplus mentioned above, to the method of procurement. Although, the Tamil Nadu Civil Supplies Corporation does make open market purchases directly from the producers as a measure of price support, it is mainly the system of levy on traders/millers that has been adopted. Till Samba 1975, compulsory procurement from the producers was in force. This was given up with improvement in the food situation. During Kuruvai 1977, a trader's levy of 10 per cent on paddy and 20 per cent on rice stocks moving from surplus districts to other districts in Tamil Nadu had been imposed. A levy on millers had also been imposed. In May 1978, trader's levy, millers' levy and all other restrictions were totally removed. In 1980, trader's levy at 40 per cent was imposed throughout the State at the point of first purchase of paddy or rice by the wholesale dealers. In 1981, to increase the quantum of procurement, the levy on trader's was increased to 50 per cent. In the wake of the acute drought situation in the State in 1982, monopoly procurement was introduced in Thanjavur and parts of adjoining Tiruchi and South Arcot districts and a total ban on purchase by private trade, with movement restrictions was

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* Prof. Raj Krishna found a high negative elasticity (-4.35) of procurement to output of rice in Tamil Nadu (vide Agricultural Price Policy in India - A case Study of Rice: The Indian Economic Journal, January-March 1981). He observed that "the non-economic reasons which caused this odd relationship need further investigation". What has been responsible for the negative elasticity is the perverse relationship between procurement and production in Tamil Nadu as mentioned above.

imposed. The aim has been to mop up the entire marketable surplus of paddy in the monopoly procurement districts. In the other areas of the State, 50 per cent traders' levy scheme has been in force. That direct purchase from the producers is more effective in increasing the volume of procurement is evident from the resort to monopoly procurement whenever larger procurement had to be made.

An important determinant of volume of procurement, as mentioned before, is the differential between farm harvest price and procurement price. The less is this differential, the greater is likely to be the volume of procurement. The proportion of farm harvest price* to procurement price which was 140 per cent in 1976-77 got reduced successively to 116.5 per cent in 1980-81. The weighted average peak marketing wholesale price of rice II sort from 1976-77 and its ratio to procurement price is given in Table below:

TABLE V: The Weighted Average Peak Marketing Wholesale Price of Rice II Sort and its Proportion to Procurement Price

Year	Farm harvest price of rice II sort (Rs. per quintal)	Proportion to procurement price for coarse paddy converted to rice (percentage)
1976-77	155.9	140.0
1977-78	141.6	122.5
1978-79	149.2	94.7
1979-80	178.8	113.5
1980-81	200.9	116.5

Source: State Department of Statistics; Government of Tamil Nadu.

* Peak marketing wholesale prices are considered to be farm harvest prices by the State Department of Statistics.

The drought allowance over and above the procurement price given in areas of monopoly procurement, has also been an important factor in facilitating procurement.

The perverse relationship between production and procurement can be traced to less offtake of rice from the public distribution system during a good harvest (as in 1977-78 and 1979-80) when there was easy availability of rice and reasonable prices in the open market. Under these conditions, there was no compulsion to purchase larger quantities. In other words, procurement has been limited to the requirements of the public distribution system.

Underlying the perverse relationship, is the absence of a buffer stock policy which entails a larger procurement in a good crop year in order to have a comfortable buffer stock to meet a situation of shortage in a bad crop year. In the Note on Food Policy placed on the Table of the Legislative Assembly in 1975, the then Minister for Food and Co-operation summed up the position thus:

"In times of food scarcity we get excited and deeply perturbed. To tide over the emergent situation, we seek to evolve a new food policy. When the difficulty ceases and crops are plentiful, we revise that policy. In times of plenty and bountful production of foodgrains, we do not even consider it necessary to adopt any policy in respect of food. It would therefore be in our interest to evolve a long term policy with perspective and vision, rather than shuttle from one ad hoc strategy to another".

The ad hoc nature of food policy mentioned above and which was continued, has stemmed from the reluctance to use procurement to build up a buffer stock so as to even out the impact of short term fluctuations in production by adding to

availability during shortages and withdrawing surplus production during relative abundance. In good years, the size of the operational stocks would be reduced while adding to the buffer stock. It would be prudent to hold stocks equivalent to two years offtake from the public distribution system as has been recommended by the technical group set up by the Government of India.[11/] Not all the stocks need be kept with the State Government. Part of it can be handed over to the Central Pool. The stocks would have to be turned over once a year as rice may not keep for more than a year. This would have to be done either by using a part of the buffer stock for food-for-work-programmes or for the free nutrious meal programme or for export as was done in 1979-80.

Meeting the minimum food requirements of the low income consumers

8. The Public Distribution System

It is by the public distribution system that the minimum food requirements of the low income consumers are sought to be met. By supplying specific quantities of foodgrains at prices below the open market rate, the public distribution system seeks to ensure a minimum food consumption for the low income groups. Thus it is a step towards achieving a measure of equity in food consumption.

Three characteristics of the public distribution system in the State may be noted. The first is that until recently no target groups as such had been specified. From 1 February 1983, due to the tight supply position of rice, the Government decided to restrict the supply of rice on family cards to those families whose income is less than Rs.1000 per month. It is significant to note that out of 118 lakh family cards

distributed, only slightly over 5 lakhs accounted for families with a monthly income of more than Rs.1000.* The remaining 113 lakh card holders are supplied rice through the fair price shops. The second characteristic is that only "superior grains", rice and wheat, are distributed through FPS. Not that coarse cereals are not at any time procured and distributed. In 1983, when increase in price of ragi in the open market was noticed, the Tamil Nadu Civil Supplies Corporation purchased ragi in the open market and distributed it through fair price shops. However, such intervention in respect of coarse grains has been rare. In fact, a preference for rice and wheat in the rural areas of the State is being fostered by the practice of not supplying coarse grains through FPS. The third characteristic is that unlike in many other States, FPS in Tamil Nadu are run either by the Tamil Nadu Civil Supplies Corporation or by co-operatives. Recently, it was announced by the Government that the FPS would be run exclusively by the Co-operatives. The private traders are thus to be eliminated.

9. Issue price and "economic" price

As a welfare policy, rice is supplied through FPS at a price below the "economic price". To illustrate, when the Tamil Nadu Civil Supplies Corporation was directed to offer Rs.105 per quintal for common variety and Rs.109 per quintal for fine variety of paddy as procurement/support price (1978-79 and 1979-80), the economic cost of rice per quintal (including cost of cleaning, drying, hulling, storing and transport) according to the State Government worked out to Rs.220 and Rs.228 respectively, representing a retail price of

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* This casts doubts on the veracity on monthly income declared.

Rs.2.20 and Rs.2.28 per kg. respectively. As against this, the retail prices fixed by the Government for public distribution have been Rs.1.60 per kg. for common variety and Rs.1.85 per kg. for fine variety, the difference between the "economic price" and the retail price fixed being borne by the Government as subsidy. The "economic price" of rice obtained from paddy procured in 1983 has been calculated at Rs.271.50 per quintal for common variety and Rs.278.55 per quintal for fine variety[12] (this excludes the monopoly procurement areas where higher procurement prices are being paid; in these areas, the economic price has been calculated at Rs.329.60 per quintal for common variety and Rs.336.10 per quintal for the fine variety). However, the retail issue price of rice through FPS was Rs.1.75 per kilo of common variety and Rs.2 per kg. for fine variety. It may be noted that the open market retail price of common variety of boiled rice ranged between Rs.2.40 and Rs.4.20 in February 1983. The difference between the issue price and economic price, as mentioned above, is being borne by the State Government as subsidy. The magnitude of this subsidy has been calculated at Rs.110 crores.[13] It has been justified by the Government on the ground that it "has been done in the interest of the poor consuming public who largely depend on the rice supplied through family cards". In the light of the prospects of food production and with a view to reduce the food subsidy, the issue price of rice was raised from Rs.2 to Rs.2.25 per kg. for fine variety and from Rs.2.15 to Rs.2.50 per kg. for super fine variety from November 1985. The price of common variety which was Rs.1.75 per kg. was however not raised in the interest of low income groups.

10. Distribution outlets:

There are over 20,000 distribution outlets (FPS) of which over 16,000 are in rural areas and the balance in urban areas. So as to reach out to all villages, village FPS have been established in each revenue village. It is proposed to have one FPS for every 1000 cards, the ultimate goal being opening of one shop for every 500 cards.

The quantum of rice which the Government has proposed to be made available through FPS has been, until the severe drought of 1982, 1 kg. per adult per week or 20 kg. of rice for each family per month. In practice, however, the amount distributed have been very much less. On the basis of 118 lakh cards and 20 kg. per card per month, the amount required to be distributed comes to 28.3 lakh tons whereas Table VI indicates only about 27 per cent of rice has been distributed. Of course, some card holders may not buy from fair price shops. If besides rice, wheat and wheat products are taken into account, the amount made available may come to 20 kg. The shortfall in foodgrains production in 1984-85 led to a reduction of the quantum of rice made available from 20 kg. to 12 kg. per month from November 1985.

In addition to rice, wheat is being supplied to family card holders through FPS. The quantum of supply which was 5 kg per card per month in 1980, was increased to 20 kg per card per month due to increased allotment from the Central Pool, and was being distributed through FPS at Rs.1.87 per kg. from April 1983. In view of the substantial improvement in the supply position of wheat in the country, ration card holders have been allowed to draw wheat without restriction on quantity from FPS in 1986. Following the rise in the issue price of wheat from Rs.172 to Rs.190 per quintal

effected by Government of India in February 1986, the State Government fixed the retail price of wheat at Rs.2.05 per kg.

The total public distribution of rice and wheat from 1978 to 1981 is indicated in Table below:

TABLE VI

Total Public Distribution of Rice and Wheat (Calender year) (in 000 tons)

Year	Total public distribution of rice from Central Pool and State Government	Wheat from Central Pool distributed
1978	111	466
1979	318	457
1980	303	356
1981	775	368

Source: Bulletin on Food Statistics 1981-82.

In respect of rice, procurement has been supplemented by allocation from Central Pool, while wheat is entirely allocated from the Central Pool. Table VI brings out that in good years, distribution of rice through FPS declines with free availability in the open market. The public distribution of wheat, which has been more freely available than rice, has been greater than that of rice until 1981, indicating greater consumer demand for wheat, especially in urban areas. It is also partly a reflection of the diversification of the food habits of the people, a development to be encouraged.

11. Assessment of benefit from Public Distribution System

The extent to which low income consumers have been benefitted by PDS is dependent on how widely the distribution outlets have spread and on this group's purchasing power. A study on public distribution of foodgrains State-wise made in 1977 indicates that of the total quantity of foodgrains distributed in Tamil Nadu, rural areas accounted for about 24 per cent.[14] Since then, with the opening of FPS in every revenue village, the offtake (based on family cards) from rural areas has increased to 60 per cent according to Tamil Nadu Civil Supplies Corporation. It is in respect of accessibility to food or "entitlement" to foodgrains on the part of the deprived groups that PDS by itself is inadequate. If 2250 calories per day is required as the minimum required on nutritional grounds, the expenditure groups below Rs. 28/per capita per month in rural areas do not get the required calories according to NSS Report on Twenty Sixth Round Survey of Consumer Expenditure (July 1971-June 1972). For these groups, PDS has to be integrated with programmes seeking to provide employment and purchasing power. In this context, the free nutritious meal programme launched by the Government assumes relevance and importance.

Conclusion

It was mentioned at the beginning that the objectives of public intervention have been three-fold. First, to ensure a remunerative price to the producer; second, to make available specific quantities of food grains to the low income consumers at prices below the open market rate and third, to even out annual fluctuations in production through building up of buffer stocks.

The first has been sought to be achieved by procurement at the procurement/support price announced by the Government. By opening levy collection centres under the trader's levy scheme as well as direct purchase centres in the monopoly procurement areas, the Tamil Nadu Civil Supplies Corporation has prevented the producer price from falling below the procurement/support price. However, the support has been mainly extended to rice; purchases of coarse cereals has been rare. This may be due to the fact that the coarse cereals cannot be stored for long. Again, the proportion of procurement to production has been meagre. This has forced the Tamil Nadu Civil Supplies Corporation to purchase from other States (surplus States).

As regards the second, a minimum supply (20 kgs of cereals per family per month) has been made available through FPS at a price below the economic price involving a substantial subsidy from the Government. As has been pointed out, "if income cannot be redistributed directly and if the low income population of a poor country would suffer unacceptable cuts in food consumption at market-clearing prices, a concessional (subsidized) food supply system becomes a necessity".[15] Whether even this concessional food supply can be availed of by the very low income population depends on their purchasing power. It will be necessary to supplement the concessional food supply by programmes for employment and income generation.

It is in respect of the third, the public intervention in the foodgrain economy in Tamil Nadu has fallen short of its objectives. There has been no systematic effort to build up a sizeable buffer stock to counter the instability in foodgrain production to which the State is particularly prone. Lack of adequate storage facilities, the cost of storage, and the need to turn over stocks may have stood in the way of implementing a buffer stock policy. In this respect, a "food security" system has yet to be built up in the State.

References

1. For a study of the evolution of food policy, vide Evolution of Food Policy in India by R.N. Chopra, 1981.

2. Foodgrains Policy Committee Report, 1943, Government of India, Page 2.

3. Government of India Resolution No.6-2/65-C(E) dated 18.1.1965, Ministry of Food and Agriculture.

4. In 1978-79, while the price recommended by APC for paddy (coarse) was Rs.82 per quintal, the price announced was Rs.85 per quintal. In 1979-80, the recommended price was Rs.90 per quintal while the announced price was Rs.95 per quintal. Similarly in 1980-81, while the recommended price was Rs.100 per quintal, the announced price was Rs.105 per quintal.

5. National Commission on Agriculture, Interim Report on Agricultural Price Policy, February 1975.

6. State in Foodgrain Trade in India by Garg: Appendix IV.

7. Evolution of Food Policy in India by R.N.Chopra - p.231.

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13. Ibid.

14. Commerce, September 15, 1979: Article by S.M. Shah entitled Foodgrains Distribution over 12 million tons.

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CHAPTER IX

Implications for Policy

1. Need for a macro-level approach

The analysis of the various facets of the foodgrain economy of the State in the previous chapters have important implications for policy. The policy implications have, however, to be considered at the macro-level. Afterall, the foodgrain economy is part of the over-all economy and developments in the latter impinge on the former. Thus growth in population and growth in percapita net domestic product determine the rate of growth of foodgrain demand. On the supply side, the rate of growth of foodgrain production depends to a large extent on public investment in infrastructure such as irrigation and research and development and provision of incentives to the producer. The "entitlement" to food hinges significantly on distribution of assets and income, creation of employment opportunities in agriculture and industry and on welfare measures, which again is a matter of public policy. Thus policy implications have to be viewed in a wider context than in the context of the foodgrain sector per se.

2. Achieving a faster rate of growth in foodgrain output

(a) Rate of growth of foodgrain output in relation to population and income growth

Foodgrain output should grow at least at the minimum rate dictated by the growth rate of population, since population growth accounts for about 70 per cent of the growth in demand for foodgrains. Between the triennium ending with 1962-63 and that ending with 1972-73, the rate of growth of foodgrain output in the State just kept pace with

population growth. During the next decade, between the triennium ending with 1972-73 and 1982-83, the rate of growth of foodgrain output has been negative due to the marked setback to foodgrain production in the early eighties (1980-81 and 1982-83) due to adverse seasonal factors. It would, therefore, be more appropriate if the terminal year is taken as the triennium ending with 1979-80. Even so, the rate of growth of foodgrain output (between the triennium ending with 1972-73 and that ending with 1979-80), falls short of population growth. The following table indicates the growth rate of population and of foodgrain production during the two periods mentioned above:

TABLE I: Growth Rate of Population and of Food Output

Population		Foodgrain output (Compound rate of growth percent per annum).	
1961 to 1971	1971 to 1981	Between triennium ending with 1962-63 and that ending with 1972-73	Between triennium ending with 1972-73 and that ending with 1979-80
2.2	1.7	2.1	1.5

The low rate of growth of population between 1971 and 1981 (in fact it has been the lowest rate among the States) cannot be taken to represent a trend, since the death rate has not been falling at a perceptible rate (particularly the infant mortality rate).

The other determinant of foodgrain demand is income growth. While the demand for foodgrains changes in proportion to population growth, the effect of income growth on food

demand depends on the income - elasticity of demand. Between 1970-71 and 1981-82, percapita State net domestic product (percapita income) at constant prices grew at 1.6 percent per annum.[1] The expenditure elasticity of demand for rice, the dominant cereal in the State, as calculated from the NSS Consumer Expenditure Survey for 1973-74 comes out to be 0.5 for all consumers for both rural and urban areas.* Applying this expenditure elasticity coefficient to the growth in percapita income, the income effect on foodgrain demand is of the order of 0.8. There is some justification for taking rice as representing foodgrains as a whole, since "Tamil Nadu belongs to the category of States where coarse grains form a significant proportions of cereal consumption in rural areas but the major cereal is rice."[2]

Thus, to meet the demand arising from population and income growth, the warranted rate of foodgrain output is 2.5 percent per annum (1.7 percent due to population growth and 0.8 percent due to income growth). That foodgrain output grew only at the rate of 1.5 percent per annum indicates the leeway that has to be made up. In fact, as a desirable objective, the aim should be to achieve a growth rate of 3.0 percent per annum to allow for a sufficient cushion against unforseen contingencies.

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* In his paper on "Patterns of Foodgrain Consumption in India : A Multi-stage Budgeting Model" presented at the Regional Conference of the Indian Econometric Society held at Sri Venkateswara University, Tirupati in October 1985, Mr. K.N. Murthi comes to the conclusion that expenditure elasticities for foodgrain items are quite large and approach unity for poorer households. The expenditure groups, 1,2 & 3 (representing Rs.0-24, Rs.24-34 and Rs.34-55) who cover about 63 per cent of rural population and 47 percent of urban population, have, according to him, estimated expenditure elasticity for rice ranging from 1.018 (for group I), to 0.923 (for group 2) and to 0.812 (for group 3) in rural areas. The consumer expenditure data used are from the 28th round (1973-74) NSS report.

(b) Raising the level of productivity

The key to faster growth in foodgrain production lies in raising the level of productivity. Since, as mentioned above, rice is the dominant cereal, it is the stepping up of rice productivity that will have the most visible impact on foodgrain production. The following table indicates the level of productivity in the major rice producing States in the country; the All-India level is also indicated.

TABLE II: Level of rice productivity in 1983-84
(kg per hectare)

Andhra Pradesh	2106
Haryana	2486
Punjab	3063
Tamil Nadu (1981-82)	2265
Kerala	1666
All-India	1458

As will be seen, Tamil Nadu stands third in the level of productivity, next to Punjab and Haryana. Punjab has exceeded a productivity level of 3 tons per hectare. This has been the reason why with only 56 percent of the rice area of Tamil Nadu, Punjab has been able to produce 51 lakh tons in 1984-85 compared to 54 lakh tons in Tamil Nadu in the same year. If the present trends continue, a non-traditional rice producing State bids fair to outstrip a traditional rice producing State in output.

Several reasons have been adduced for the rapid development of rice production in Punjab where production rose from 14.5 lakh tons in 1975-76 to 50.6 lakh tons in 1984-85 representing a three-and-a-half-fold increase.

Some of the more important factors accounting for this development[3/] have been: favourable ecological conditions; relatively low man-land ratio; long history of successful crop and animal husbandry; assured irrigation; small farmers being not at a disadvantage with respect to factor and output prices; progress of rural electrification and consolidation of holdings; rural bins in development; and not the least an assured "export market" (in the sense of purchases by the Food Corporation of India for export to other States in the country).

Similar conditions cannot be reproduced in other States. Tamil Nadu, particularly, lacks assured irrigation; moreover, while Punjab is irrigated by perennial rivers, the rivers in Tamil Nadu are dependent on undependable monsoon rain. This has stood in the way of a level of consumption of fertilizers equal to that of Punjab. The task of raising the level of rice productivity to the Punjab level is, therefore, by no means easy.

The Government of Tamil Nadu has recently launched a "5 tons of paddy a hectare programme", which involves increasing the productivity of rice from 2.2 tons per hectare attained in 1981-82 to 3.0 tons per hectare. The strategy envisaged to attain the proposed level of productivity is to step up the productivity of Samba rice crop, the major rice crop in the State, by giving a big thrust to irrigation and drainage, popularisation of a package of improved practices through the Training and Visit (T&V) System and pest and disease control.

However, it has to be recognized that the cropping season for Samba, namely October to February, is not conducive to high yields. During this period, the days are short, the North East monsoon rains raise the level of

humidity, thereby increasing the chances of attacks from pests. Hence, unless it is possible to evolve a strain of paddy for this season which is pest and disease resistant, it will be difficult to attain the productivity level envisaged. It is far more easy to attain the proposed level of productivity during the Kuruvai season when photosynthesis takes place for a long time because of longer daytime and the chances of pest attacks are considerably less. The crop can also be harvested before the setting in of the North East Monsoon. However, with respect to Kuruvai, the essential requirement is timely water supply which depends on agreement with Karnataka on the sharing of Cauveri waters.

Assuming that a level of productivity of 2.5 tons per hectare will be attained* and that this level will continue upto 1991, will this meet the requirements stemming from population and income growth ?

By 1991, the population of Tamil Nadu has been projected to be 53.0 millions by the Expert Committee on Population Projections in their Report in 1979. This represents an increase of 10.4 percent over the 1981 population census level. The projection may appear to be on the lowside; however, considering the success of the family planning programme in the State and the projection of a reduction in the percentage of married females to total females in the age-group 15-44 from 72.66 in 1981 to 68.43 in 1991, the projected population of the State might not be far off the mark.

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* The State Department of Agriculture has claimed that this level of productivity has already been attained in 1985-86 season.

The trend growth rate of State Income at constant prices between 1970-71 and 1981-82 has been 2.87 percent (compound growth rate). Assuming that this trend growth rate would prevail upto 1991, percapita State Income would increase from Rs.692 in 1981-82 to Rs.816 in 1991, representing a compound growth rate of 1.8 percent. Applying the expenditure elasticity coefficient of 0.5, the income effect on rice demand would be of the order of 0.9 percent.

Thus, to meet the demand arising from population and income growth, rice production would have to grow by 2.0 percent per annum between 1981 and 1991 (1.04 percent due to population growth and 0.9 percent due to income growth).

The implications for rice production may be noted. Rice production would have to touch the level of 69 lakh tons in 1991. On the basis of a level of productivity of 2.5 tons per hectare and an average acreage level of 25 lakh hectares, the production in 1991 would be 62.5 lakh tons.

The following Table summarises the positions:

Table III: Estimation of demand for and production of rice in 1991.

Rate of growth of population (percent per annum) 1981-1991	-	1.04
Rate of growth of demand arising from population & income growth 1981-1991 (percent per annum compound)	-	2.0
Production of rice in 1981 (lakh tons)	-	57.0
Production of rice to be attained in 1991 to meet the demand (lakh tons)	-	69.0
Production of rice in 1991 on the basis of 2.5 tons per hectare (lakh tons)	-	62.5

Thus, even on the basis of a productivity level of 2.5 tons per hectare, production would fall short of the estimated demand in 1991.

The highest level of rice production so far attained has been 58.0 lakh tons in 1979-80. To reach the level of 69 lakh tons, a breakthrough in Samba production has to take place. This means, as pointed out already, evolving a strain of paddy resistant to pests and diseases. In other words, further progress has to take place in yield-raising technology.

Raising the productivity of other components of foodgrains

The need for raising the productivity of other components of foodgrains, coarse cereals and pulses, is equally important. It was only in the 1970's that the negative growth rates in the production of coarse cereals have been transformed into a positive one due to the increase in the coverage of area under HYV'S. Even so, the level of productivity of jowar and bajra in the State has been less than one ton per hectare (average of triennium ending 1981-82).

Jowar being the most important coarse cereal in the State both in respect of area and production (vide Annexure: Table I : Chapter IV), it is to increasing the productivity of jowar that attention has to be directed. Jowar has multifarious uses and is gaining in importance as a source of food, feed and industrial raw material. The principal cause of low yield has been the cultivation of traditional non-fertilizer-responsive varieties. Recently, a variety 6024 which is high yielding, fertilizer-responsive and suitable for both dry and irrigated conditions has been introduced. The wider adoption of low-cost technology is

essential not only to raise the level of productivity but also to bring down prices.

Bringing down prices by increasing productivity would stimulate consumption by low income consumers in the rural areas for whom coarse cereals are a staple food. Between 1970-71 and 1981-82, the wholesale prices of Jowar have gone up by 187 percent, and that of bajra and ragi by 203 and 223 percent respectively and this has reduced the differential between rice prices and coarse cereal prices. Since coarse cereals are not normally procured and distributed through the fair price shops, the low income consumers in the rural areas have been exposed to the vagaries of market forces. Market dependence has been further reinforced by the shift in traditional form of payment in kind to payment in cash for most of the agricultural operations.

Simultaneously with increasing the productivity of coarse cereals, there should be a sustained effort to widen the market by improvement of marketing facilities which would facilitate the movement of coarse cereals to other regions. There should also be procurement of coarse cereals to make them available for school and hospital feeding programmes which can give a fillup to their production.

Although pulses are not a substitute for cereals but are only complementary, their inadequate intake per capita can be rectified only by increased output. This again depends on raising the level of productivity which is very low, less than the all-India average. The low productivity has been due mainly to their being grown predominently under rainfed conditions and on poor soils with no application of manures or fertilizers.

The major constraint to increasing productivity has been the quality of seed. A Six Year Programme was started in the State in 1980 with a view to double production over a period of six years by the end of 1985-86. The scheme stresses the importance of quality seed production and a training programme for farmers in the use of improved varieties. In addition, a Centrally Sponsored Scheme for Pulses Development was iniated in October 1982 to encourage farmers to adopt the latest crop production technologies in pulses by means of large scale demonstration of the use of inputs. A minikit demonstration programme is being implemented under the Centrally Sponsored Scheme involving the distribution to farmers of seed packets of pulses free of cost for popularising improved varieties.

The impact of these two programmes on pulse production in the State has yet to be felt. Production touched the level of 2.2 lakh tons in 1978-79; since then it has been declining due to adverse seasonal conditions. Productivity which reached the level of 355 kg per hectare in 1978-79 declined to 314 kg per hectare in 1981-82. Besides adoption of improved strains, the cultivation of pulses has to be integrated with that of cereals in order to step up the output with a view to reduce the imbalance between supply and demand.

3. Eradicating hunger

Growth in foodgrain production is a critical pre-requisite for combating hunger defined as inadequate food intake (in terms of calories). Hence hunger is primarily related to undernutrition. Availability of food does not by itself help to eradicate hunger. As Professor A.K. Sen has pointed out,[4/] hunger is a function of "entitlements"

and not of food availability as such. Accoding to him, entitlement relationships fall into two broad categories (1) ownership of productive assets including skills and (2) "exchange entitlement mapping" or what a person can command through labour or other markets (market exchanges) or through welfare programmes. In other words, what food a person can command depends on (a) purchasing power and (b) what the government can provide as a welfare measure.

As regards the magnitude of hunger, it was mentioned in Chapter I that based on the quick tabulation of NSS household expenditure data from the 32nd round (July 1977 to June 1978), it was estimated for the Sixth Five Year Plan 1980-85, that 55.68 percent of the people in the rural areas of the State and 44.79 percent or a total of 24 million people (17 million in the rural areas and 6.7 million in the urban areas) had incomes which could not provide a minimum daily calorie intake of 2400 per person in rural areas and 2100 in urban areas. According to this estimation, Punjab has the lowest percentage of people with incomes not adequate to ensure the minimum calorie intake (15.13 percent of total population of the State) followed by Haryana with 24.84 percent. Tamil Nadu with 52.12 percent of the total population in this category stands 13 among the States (excluding the Centrally Administered Areas); vide Annexure. Table I.

A disaggregation of the lower income groups into separate socio-economic groups reveals that it is the landless labourers and marginal farmers* who suffer most from

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* below 1.0 hectare.

entitlement failure. The number of agricultural labourers in the State increased from 4.5 million in 1971 to 5.9 million in 1981, representing an increase of 31 percent. It is difficult to estimate the number of landless agricultural labourers in this group. However, it would be reasonable to assume that the bulk of them belong to the landless category. As regards the marginal farmers, the successive Agricultural Censuses of 1970-71, 1976-77 and 1980-81 reveal that their economic condition has been deteriorating. There has been a "marginalisation" of holdings in the sense that the share of marginal farmers in the number of operational holdings has increased from 58.8 percent in 1970-71 to 64.6 percent in 1976-77 and to 69.1 percent in 1980-81.[5/] The average size of operational holdings of marginal farmers has witnessed a decline from 0.42 hectare in 1970-71 to 0.41 hectare in 1976-77 and to 0.40 hectare in 1981-82. It may also be mentioned that the average size of operational holding in the State has declined from 1.45 hectares in 1970-71 to 1.25 hectares in 1976-77 and to 1.08 hectares in 1981-82. This has been attributed to fragmentation of holdings due to inheritance and distribution of surplus land among weaker sections of the population.

As regards the move towards a more egalitarion distribution of assets through land ceiling and distribution of excess land above the ceiling and its impact on skewness in distribution, the Gini co-efficient may be considered. Between 1970-71 and 1976-77, the Gini coefficient calculated from the distribution of operational holdings in the State, has remained practically unchanged. It was 0.5731 in 1970-71 and 0.5723 in 1976-77, a decrease of only 0.14 percent. Thus there has not been any visible move towards a more equal distribution of assets, the most important of which has been land.

Rural poverty is often correlated with income per head in rural areas and it has been found that the former is inversely related to the latter.[6/] The following Table indicates the State Net Domestic Product from Agriculture per head of rural population.*

TABLE IV

Net Domestic Product from Agriculture per head of rural population in Tamil Nadu.

(in Rs)

Year	Net Domestic Product from Agriculture per head of rural population
1971	347
1972	333
1973	360
1974	255
1975	339
1976	317
77	363
78	351
	309
	251
	293

Between 1971 and 1977, the State Net Domestic Product from ıculture per head of rural population grew at the compound

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* Rural population for each year has been arrived at by applying the same growth rate of rural population between 1971 and 1981, namely 1.27 percent per annum.

rate of 0.8 percent per annum, less than the growth rate of rural population. Since then, there has been a deceleration in the growth of Net Domestic Product from Agriculture per head of the rural population due to the effect of weather on agricultural production. This underlines the need, as pointed out in Chapter VI, to bring about a certain measure of stability in foodgrain production.

In respect of direct welfare measures aimed at increasing the food intake of lower income groups, mention may be made of the public distribution system and the free nutritious meal programme. One of the reasons for Kerala having a lower percentage of people below the poverty line than Tamil Nadu (47 percent in Kerala compared to 52 percent in Tamil Nadu) inspite of Kerala having a lower per capita income (Rs.636 compared to Rs.667 in Tamil Nadu in 1981-82), has been its wide network of the public distribution system throughout the State. It reaches over 97 percent of the population in urban and rural areas, thus ensuring a mir of foodgrains and other essential goods to the people. Although the "urban bias" in the public distribution is sought to be corrected in Tamil Nadu by opening mo. rural outlets and by exercising greater supervision ov functioning of rural fair price shops, the fact that coa. cereals are not procured and distributed through the fa' price shops deprives the lower income groups in the rura areas of their "preferred cereal". However, the public distribution system safeguards the consumption of the lower income groups, who have the needed purchasing power, against the vagaries of market forces.

If accessibility or "entitlement" to foodgrains has to be increased, the public distribution system has to be integrat with programmes seeking to provide the lower income groups

with employment and purchasing power. There has been as yet no quantitative assessment of the extent to which the implementation of the Integrated Rural Development Programme (IRDP), the National Rural Employment Programme (NREP) and the Rural Landless Labour Employment Guarantee Programme (RLEGP) in the State have created additional employment and incomes. It has been mentioned in the document on the Seventh Five Year Plan 1985-90 Vol. I that the percentage of population below the poverty-line has been reduced from 48.3 in 1977-78 to 37.4 in 1983-84 in the country. If the same percentage reduction is applied to Tamil Nadu, the percentage of population below the poverty-line should have been reduced from 52.1 to 41.2. It means that over 40 percent of the population lacked adequate income in 1983-84 to obtain the required minimum of calories. To ensure them the required minimum of calories percapita per day and hus alleviate hunger, is the challenge facing the ernment.

Annexure Table I : Number and Percentage of People below Poverty-Line[1/]

State	Rural		Urban		Combined	
	Number (Lakhs)	Percent	Number (lakhs)	Percent	Number (lakhs)	Percent
Andhra Pradesh	170.35	43.89	36.44	35.68	206.79	42.18
Assam	88.34	52.65	7.07	37.37	95.41	51.10
Bihar	338.44	58.7	32.94	46.07	371.38	57.49
Gujarat	94.84	43.20	26.48	29.02	121.32	39.04
Haryana	22.10	23.25	6.95	31.74	20.05	24.84
Himachal Pradesh	10.37	28.12	0.51	16.56	10.88	27.23
Jammu & Kashmir	14.57	32.75	4.35	39.33	18.92	34.
Karnataka	124.10	49.88	38.62	43.97	162.72	48.3
Kerala	93.42	46.00	22.19	51.44	115.61	46.95
Madhya Pradesh	244.57	59.52	42.74	48.09	287.33	57.73
Maharashtra	214.11	55.85	61.30	31.62	275.41	47.7
Orissa	158.97	68.97	10.33	42.19	169.30	66.
Punjab	13.49	11.87	9.59	24.66	23.08	15
Rajasthan	85.79	33.75	19.62	33.80	104.91	3
Tamil Nadu	170.47	55.68	66.59	44.79	237.06	5
Uttar Pradesh	429.93	50.23	72.27	49.24	502.20	5
West Bengal	227.65	58.94	48.10	34.71	275.75	5
All-India (weighted)	2527.74	50.82	518.36	38.79	3046.10	4

1/ Poverty line of Rs65 per capita per month in 1977-78 prices corresponding to minimum daily calorie requirement of 2400 p person in rural areas and poverty-line of Rs75 corresponding to calorie requirement of 2100 in urban areas; based on provisional and quick tabulation of NSS household consumer expenditure survey of 32nd round (July 1977 to June 1978). Number of people below poverty-line relates to population as on March 1, 1978. The Table is based on the statement of Minister of Planning in Rajya Sabha on 3rd November 1982.

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