

**POPULATION
FOOD AND LAND
INEQUALITY IN INDIA
1971**

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A GEOGRAPHY OF HUNGER AND INSECURITY

**ASOK MITRA
SHEKHAR MUKHERJI**

AN ICSSR/JNU/FPF STUDY

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ASOK MITRA
SHEKHAR MUKHERJI

AN
INDIAN COUNCIL OF SOCIAL SCIENCE RESEARCH,
JAWAHARLAL NEHRU UNIVERSITY AND FAMILY PLANNING
FOUNDATION STUDY



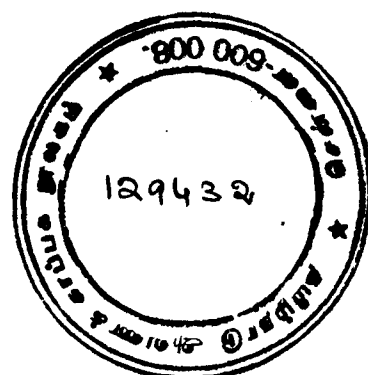
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Preface

Paradoxically enough, in India, areas of high agricultural productivity and zones of malnutrition exist side by side. So it is a matter of high importance to investigate the geography of hunger and insecurity in India, especially in relation to regional variation in agricultural productivity and concentration of land ownership, agricultural inputs and investments.

A number of happy circumstances encouraged us to undertake this study of the situation as it existed in 1971. First, the Population and Agricultural Censuses of 1971. The agricultural census, however, was based primarily on the land records maintained in every state. Second, the results of a rather unique exercise undertaken by G. S. Bhalla, Y. K. Alagh and others under the auspices of the Planning Commission, called *Foodgrain Growth: A Districtwise Survey of 19 Crops, 1962-65 to 1970-73*, published in 1976, which yielded figures of per hectare yield and agricultural growth rates for the period under review as well as of total annual districtwise production, crop by crop. These sources provided a reasonable tally of information on population and distribution of land owned on the one hand and agricultural productivity and rate of growth around 1971 on the other. It is necessary to state at this point that we have based all our computations on the results of the Bhalla-Alagh study, warts and all, in the matter of agricultural growth and productivity and have not gone in for any other estimates, for the simple reason, among other weighty ones, that the Bhalla-Alagh study alone has processed agricultural data on a uniform basis for as many as 282 districts and groups of districts. No other study gives us uniformly processed data for so many districts of India nor affords scope for a comparable regional survey.

In fact, this exercise is in more ways than one based on the Bhalla-Alagh study. The latter was confined to annual production estimates of 19 crops: rice, wheat, jowar, bajra, maize, ragi, barley, gram, tur (arhar), groundnut, rapeseed and mustard, sesamum, linseed, castorseed, sugar cane, cotton, jute, mesta and tobacco. The present exercise is limited to estimates of the first nine crops of this list. In our judgement, the first seven constitute the main cereals of the mass of the Indian people. As the Bhalla-Alagh study states, "the data on pulses is not complete. We have included only gram and tur in our study and have neglected all other pulses." (mimeograph, Part I, p. 120). To that extent, fault could certainly be found with the estimates of foodgrains production, district by district, given in the text and the appendices, particularly those concerned with absolute deficits

and surpluses. Were complete data available for all foodgrains, seasonal, non-seasonal, traditional, non-traditional, including all varieties of pulses like masur, khesari, moong, matar, urud, etc., our districtwise estimates of production, surpluses and deficits would stand modified. This, as well as others briefly mentioned below, was a shortcoming of which we were aware when we thought of attempting this exercise and which we should hasten to point out at the outset. Potatoes, for instance, which made such a difference to the nutrition of the poorer sections of the population in Europe in the late eighteenth and the greater part of the nineteenth centuries, and an important enough crop for calories and nutrition, more readily consumed in India today, wherever available, than pulses, because of its cheaper price, have been left entirely out of reckoning. We have related a district's own production around 1971 to its enumerated population of that year and have left out all movements and transfers of foodgrains from district to district. We have left out other important items of sustenance and nutrition, like oils and fats, sugar, jaggery etc., the various starch roots and sources like tapioca. But we believe these shortcomings will not seriously affect the dimensional aspects of our exercise which mainly concentrates on the availability of the staple foodgrains. These constitute the principal source of nourishment of India, from which even pulses, the main source of supplementary protein in our unique legume culture, have since 1969-70 been partly squeezed out on account of high prices. These are some of the obvious gaps in a study which, however, claims the merit of having attempted for the first time a broad dimensional districtwise picture for regions and subregions within India.

It is also to be mentioned that many areas of nutritional concern in a national economy are deliberately left out, especially that of protein or nutritional inadequacy of the daily diet of the Indian population. It hardly needs to be emphasised that the problem of nutrition for the poor countries is not protein and this nutrient or that but adequacy of just food (that is, staple cereals), particularly in countries of legume cultures. The battle of nutrition is almost 90 per cent won if there is adequacy of food all round. This is, therefore, the main concern of the present monograph and it needs to be stated quite clearly at the outset.

Similarly, we could have considered other relevant nutritional aspects of the study that we deliberately omitted mainly due to the paucity of reliable and appropriate data at the district level. These could be, for instance, (1) historical studies and field works

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stressing the importance of nutrition and health in the process of demographic and economic development; (2) the importance of nutritional knowledge connecting food supply and nutritional requirements; (3) differentials between nutritional intake of urban and rural population with their variations in kind with trends of urbanization and industrialization; (4) relationship between nutritional status and level of income; (5) correlation between nutrition and the size of the household at given income levels; (6) smaller body size and shorter height and normal work performance; (7) the impact of inadequate nutrition on work performance, frequency and severity of infection; (8) impact of inadequate nutrition on physical and mental growth and development, pregnancy and lactation, fertility and family planning; (9) nutritional status of mothers in its impact on fertility, infant mortality and child-bearing; (10) the Indian demographic trend of lower infant mortality related to nutritional improvements with its subsequent impact on fertility; and (11) pricing policy and public distribution systems.

On most of these topics there is no detailed area-planning data in India, and certainly not at the investigative level of a district. So far as (3) is concerned, there is some data in India NSS rounds but this cannot be applied universally for all rural populations and all urban population sizes. There is obvious danger in making hasty generalisations based on limited data. On theme (4), the limited micro level data that exists for India does not enable any analyst to isolate the factor of nutrition from other collinear factors like housing, clothing, level of education, age and sex structure and size of household, environmental conditions in factory and home etc. On theme (5), the only comprehensive data that we have is available in the Cantor-Atac Study for Tamil Nadu and the USAID Study at Calcutta, apart from small bits of Sample Survey information available with the National Institute of Nutrition. On (6), (7), (8), (9) and (10), again no systematic data exists district by district. On (10), it is difficult to isolate the factor of nutrition from so many other factors that have led to a decline of infant mortality followed by fertility in parts of India, say, in Kerala, or in Sri Lanka.

Of course, some of these well known major issues are being investigated by the Nutrition Society of India. These investigations are in various stages of progress but none of the findings are of universal validity for all the Indian districts.

The present study has the main objective to drive home a central theme, and not to clutter itself up with a multiplicity of minor themes, none of which can

be statistically substantiated for the country as a whole.

One final word. While food is a safe index with which to delineate nutritional status, nutrition *per se* is not, because its parameters are constantly changing with our rapidly improving knowledge. Last decade's cry over protein malnutrition is an instance in point. Any country that has solved the nutrition problem in history, be it the potato revolution in Europe in the eighteenth and nineteenth centuries or food distribution as in China in our time, has done so mainly through the food approach and not the nutritional approach. The same general concern has guided this present research.

Migration is still another matter of dissatisfaction. We have made but the crudest estimate of district-wise migration for lack of availability of finer data for 1971 or of districtwise age sex structures. For our migration estimates we took into account (i) the total enumerated population of the district, (ii) the population born in the place of enumeration and (iii) the population born in the district of enumeration at the 1971 count. Better estimates of migration might have yielded different results in the chapter on Migration, Urbanization and Agricultural Productivity Levels.

This monograph attempts to investigate the following ten interrelated aspects of India's population, food supplies, malnutrition, agricultural productivity and land inequality:

1. To assess the present and future food demands and supplies in India as dictated by the present population growth rates and agricultural productivity
2. To examine how the map of scarcity goes with the map of foodgrain productivity in India
3. To determine to what extent gaps in food demands (as represented by the amount of foodgrains consumption necessary for sustenance) and in food supply (as indicated by gross output in foodgrains) prevail in high or low levels of agricultural growth and productivity
4. To delineate the regions and districts of food surplus and food deficits in India
5. To estimate the population deprived of adequate food among the five major age-sex biological groups at all-India level. It was not possible to undertake this exercise at the district level, because of the difficulties of adopting suitable surrogates for differences in consumption at the district level
6. To investigate the extent to which concentration of land ownership is related to different levels

of agricultural productivity and growth.

7. To determine the factors responsible for the creation of food surplus and food deficit at the district level in India, especially with respect to agricultural growth rates, levels of agricultural productivity, population growth rates and agricultural inputs used (like irrigation and chemical fertilizers)
8. To investigate whether or not different levels of agricultural productivity induce higher or lower rates of growth in urbanization and migration. That is, to assess the extent to which higher food availability or agricultural productivity, in certain areas, attracts migrant labour from

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elsewhere or generates the growth of employment in the non-agricultural and agricultural sectors

9. To ascertain the extent to which the maldistribution of available agricultural inputs (irrigation and fertilizer) determines the map of food surplus and food deficit in India
10. And, finally, to explore an answer to the crucial question: whether or not the existing inequality in the pattern of land ownership in India does adversely affect her agricultural development and whether this is primarily responsible for the creation of low agricultural growth rates and productivity, a large amount of food deficit and malnutrition of the population.

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A study of this kind cannot be accomplished without extensive and close team work. In fact, the entire staff of the ICSSR Project on Implications of Population Change, 1872-1971, has helped in one way or another. Of them, special mention must be made of mainly five persons who have generously assisted in this investigation: Shri R. N. Bose, Research Officer (who did computer programming and all calculations pertaining to urbanization, immigration and population growth rates and Appendix III); Shri V. S. Gahlaut, Research officer (who performed all calculations pertaining to deprived population at all-India level, summary tables on Gini co-efficients, Appendices II, IV, V and VI, and who partly assisted in calculation of food surplus and food deficit); Shri Loke Nath Ray, Research Associate (who was responsible for all calculations of Gini co-efficients for all the districts of India, drawing of Gini curves and related tables); Shri Giri Raj Singh, Research Associate (who was primarily responsible for preparation of Appendix I and who generously helped to tie up many loose ends); and Shri Karunamay Subuddhi, Research Associate (who was primarily responsible

for the major part of calculations of food surplus and food deficits in 282 districts of India). They are also acknowledged in the specific chapters to which they have contributed.

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Introduction

The year 1920 has been described as the Great Divide in the history of India's population growth. Between 1850 and 1920 the rate of growth, not only for each decade, but for the entire period of seventy years as a whole, was negligible. In the decade 1911–20 there was an actual decline. But between 1921 and 1950 the country's population grew steadily each decade, although at modest rates of 11 per cent in 1921–30, 14 per cent in 1931–40 and 13 per cent in 1941–50. Another divide came in 1951 when the rate of population growth increased by 21.51 per cent in the decade 1951–60, which further shot up to 24.80 per cent for the decade 1961–70. The rate of growth is expected to decline in the decade 1971–80 but is unlikely to go below a simple annual rate of growth of 2 per cent.

These two divides in India's history of population growth have been closely reflected in similar divides in her experience with droughts and famines. Up to 1920 India was afflicted almost every year by drought or famine in some part of the country or other, to which pestilence or epidemics added their toll of human lives. After 1920, famines and droughts, although by no means a thing of the past, became less frequent and severe, although the famine of 1943 in Bengal, Telengana and Rayalaseema was one of the worst in all history. Since 1950, droughts and famines have lost even more of their former terror. The drought in 1966 and 1967, for instance, in Bihar, Eastern Uttar Pradesh and Eastern Madhya Pradesh was so severe that it might have as disastrous consequences as the famine of 1943. But while in the famine of 1943 food did not move at all or took months to move a mere 150 to 200 miles from Calcutta, the logistics of food movement were worked out so well in 1966 and 1967 that it did not take more than a week in all even in the worst days to pack in bags food brought loose in the holds of ships to Calcutta, Bombay and Vishakhapatnam ports and rush them to remote village retail shops in drought affected areas far in the country's interior. Since Independence, famines and droughts in India have been converted to a matter of distribution of food.

Around 1950 it was usual to argue that the improvement in population growth since 1920 was primarily

due to supposed improvements in sanitation, public health and medical care. More recent investigation, however, seems to indicate that the share of these latter causes has been largely exaggerated and that this improvement was perhaps due more to improvement in employment, nutrition and food availability than to public health and medical care. Transport and communication improved, particularly road and rail communication, which considerably enhanced government's ability to despatch food with greater expedition at short notice to distressed areas. Surveillance and early warning systems to announce the early symptoms of distress and starvation were perfected. The reduction of grain exports after World War I, along with a host of agrarian and socio-economic reforms, including improvements in agricultural and industrial activity, and the growing ability of the Indian people to resist imperial exploitation were perhaps responsible for creating a climate of confidence favourable for population growth. The famine of 1943, if one reads between the lines of the Woodhead Commission Report, was largely manmade, caused by deliberate denial of, and not by the lack of means of moving, food to distressed areas. The memory of this famine worked on the public conscience so forcefully that neither an alien government nor any local government after the transfer of power in 1947 ever dared to neglect drought affected areas, however slight the scale of affliction. As a result, although large areas since 1943 have been periodically stricken with drought, approximating famine, loss in life has been negligible. For example, while the death toll in the famine of 1943 has been estimated at 2.5 to 3 million in the course of just three months, the total loss of human life in central and eastern India during the two successive years of severe drought, 1966 and 1967, did not exceed a few dozen.

After 1950, the rate of population growth accelerated to well above 2 per cent per annum. Urban and industrial growth generated fresh problems for Indian agriculture, the food distribution system and pricing policy. The race between population and food assumed new turns caused by the need to keep the price of the food basket down for industrial and urban labour, by the wars that were found forced upon India

between 1947 and 1972, by the massive populations of repatriates and refugees that India was compelled to accept, redistribute and resettle in the last thirty years, and by the swelling streams of internal migration in criss-cross patterns throughout the country. Progress in agricultural extension, technology, modernization, productivity or price structure has been far from uniform, as we shall presently see, nor has the country grown less dependent on the weather. The institutional infrastructure of agricultural growth works unevenly. On top, the country has been visited by periodic droughts. In short, the food-population debate in this country is still far from being a relic of the past. The more burning question, however, is one of inequalities of food distribution, consumption and nutrition, to which the bulk of this study is indirectly related.

We shall begin with a brief review of population change and aggregate food demand and availability up to 1983. We shall then examine in detail the balance

between food production and population as it obtained around 1971. It is customary to do this examination at the level of the country as a whole or at most at the level of the state. The wealth of information available in the recent Planning Commission-Nehru University Study of agricultural growth and productivity between 1960-61 and 1972-73 (mentioned in the Preface) has made it possible for the first time to undertake an analysis, albeit with a number of reservations, of the relationship between food supply and population at a sufficiently low level of disaggregation, namely, the district. For discussions at the district level alone, or even lower, will be relevant for area planning. We shall thereafter investigate the relationship between agricultural productivity and rate of growth on the one hand and food surplus, food deficit and distribution of land ownership on the other and consider a few conclusions that will appear reasonably to follow.

Population Change, 1950-1983

Table II.1 below gives the changes in India's population from 1921 to 1971.

TABLE II.1
Changes in the Population of India, 1921-71
(in millions)

Year	Population	Percentage decade variation
1921	251.32	—
1931	278.98	+ 11.00
1941	318.66	+ 14.22
1951	361.08	+ 13.31
1961	439.24	+ 21.51
1971	548.16	+ 24.80

The First Five Year Plan document¹ proceeded on the assumption that 'population will continue to grow over the next generation at the rate of $1\frac{1}{4}$ per cent per annum. This would mean that the population of the Indian Union at the end of 25 years from now would be of the order of 500 million.' The national income was estimated at approximately Rs. 90,000 million in 1950-51. Starting from this level, hope was expressed that the national income would be raised by over 160 per cent in about twentytwo years, and per capita income doubled, 'if capital formation is stepped up from the beginning by as much as two-thirds of the additional income each year'.² The document then proceeded to assess, on the basis of the gap existing in 1950, the gap between population and food that might occur in 1956. The estimated population in 1950 was 353.05 million, that for 1956, 337.60 million. The estimated adult equivalents at 86% for 1950 and 1956 were 303.62 and 324.74 million respectively. The production of cereals in 1949-50 was estimated at 45.8 million tonnes. The availability per adult per day in 1950 was estimated at 13.71 oz. (389 gms). On the basis of 14 oz. (397 gms) per adult per day, the requirement for consumption in 1956 would be 52.84 million tonnes³. As we shall see in the next chapter, the actual availability of foodgrains in 1956 was much greater than this figure.

¹First Five Year Plan, 1952, p.23.

²First Five Year Plan, 1952, p.20.

³First Five Year Plan, 1952, pp.157-158.

The Second Five Year Plan document considered it more appropriate to assume some increases in the rate of 12.5 per cent per decade for the population hypothesised in the First Five Year Plan. It retained the assumption of a 12.5 per cent rate of population growth over 1951-60, but revised it to 13.3 per cent for 1961-70. For the decade 1971-80, the rate assumed was 14 per cent. On this basis, the population would reach a total of 408 million in 1960-61, 434 in 1965-66, 465 million in 1970-71 and 500 million in 1975-76. These estimates were intermediate between the upper and lower estimates put forward by the Census Commissioner in his Census Report 1951. But, as the Census Commissioner himself had feared, they proved to be on the low side⁴. As for food requirements and availability, the assumptions and actuals are given in the next chapter.

The Third Five Year Plan expressed concern over recent population trends in relation to the rate of saving and economic development. It observed that the increase in India's population between 1951 and 1961 (78 million) was nearly as large as the increase (82 million) in the two preceding decades. The document proceeded to compare the population projections made in 1959 by the Central Statistical Organisation (C.S.O.) on the basis of observed birth and death rates with those provisionally worked out on the basis of the first results of the 1961 Census.

	(in million)			
	1961	1966	1971	1976
C.S.O. Estimates (1959)	431	480	528	578
Provisional Estimates based on the 1961 Census	438	492	555	625

"On the basis of the present tentative estimates for 1971 and 1976", says the document⁵, "over the period 1961-76, the total increase in population may be of the order of 187 million."

The Draft Fourth Five Year Plan published fresh projections of population up to 1980-81. It proceeded

⁴Second Five Year Plan, 1956, p.8.

⁵Third Five Year Plan, 1961, p.22.

on the assumption that population would increase at the rate of 2.5 per cent per annum during the Fourth Plan period, 1969-74. This rate would fall thereafter as there would be a decrease in the birth rate from 39 per thousand of population in 1968 to 26 in 1980-81 on the basis of an active family planning programme currently under way, and a decline in the death rate from 14 per thousand of population to 9 over the same period⁶. The figures were as follows:

Year	1967-68	1973-74	1978-79	1980-81	Index of growth, 1980-81 over 1967-68
Population (in million)	514	596	666	690	134

The Fourth Five Year Plan, as finalized in July 1970, retained the projected figures for 1973-74, 1978-79 and 1980-81 to 596, 666 and 690 million respectively but put the mid-year 1968-69 population at 527 million, which gave an index of growth of 131 in 1980-81 over 1968-69. The document retained the assumptions of the Draft document; only the death rate was expected to decline to 'less than 9' over the period 1969-1981. The document added: 'If population growth is brought down to 1.7 per cent by 1980-86 and further to 1.0 per cent by the end of the century, the population in 2000 (estimated at 890 million) will be 260 million less than what it would be if the present rate of growth continued unchecked.'⁷

The Draft Fifth Five Year Plan updated the projections as follows:

Year	1971	1974	1979	1984	1986
Population (in million)	546.9	891.2	636.8	685.8	705.2

The document made the following assumptions.

⁶Fourth Five Year Plan; Draft, 1969, pp.30-31.

⁷Fourth Five Year Plan, 1970, pp.31-32.

Gross Fertility rate would move from 169 in 1971-76 to 134 in 1976-81 and 107 in 1981-86. The life expectancy at birth would improve: (1) for males from 51.3 in 1971-76 to 53.8 in 1976-81 and 56.0 in 1981-86; (2) for females 49.6 in 1971-76 to 52.6 in 1976-81 and 55.3 in 1981-86. The birth rate would fall from 35.57 in 1971-76 to 29.57 in 1976-81 and 24.82 in 1981-86. The death rate would fall from 15.23 in 1971-77 to 12.81 in 1976-81 and 11.14 in 1981-86. The ratio of population aged 0-14 to total population would decline from 41.4 in 1971 to 40.6 in 1974, 38.4 in 1979, 34.8 in 1984 and to 33.3 in 1986. The percentage of urban population to total would increase from 19.9 in 1971 to 20.6 in 1974, 21.9 in 1979, 23.4 in 1984 and 24.0 in 1986⁸.

The Draft Five Year Plan for the period 1978-83 made the following assumptions of vital rates and revised projects for the year 1978-88⁹.

ASSUMPTIONS

Item	YEAR			
	1971-76	1976-81	1981-86	1986-91
1. General fertility rate	175	154	133	117
2. Birth rate	36.6	32.9	29.5	27.0
3. Death rate	15.2	13.2	11.6	10.4
4. Expectation of life at birth				
Males	50.1	52.6	55.1	57.6
Females	48.8	51.6	54.3	57.1

PROJECTIONS

	YEAR		
	1978	1983	1988
1. Total Population	634.2	697.2	760.5
2. Urban Population	135.6	156.7	179.7
3. Percentage of urban Population to total	21.38	22.48	23.63
4. Proportion of Population of age group 0-14 to total Population	40.5	38.2	35.7

⁸Fifth Five Year Plan, 1974-79; Draft, Vol. I, p.1.

⁹Draft Five Year Plan, 1978-83, March 1978, pp.48-49

Food Demand and Availability, 1950-1983

Between 1950 and 1978 there have been, for various reasons, wide variations between the estimated and the actual levels of demand for foodgrains. Even estimates of how much food was actually available or consumed in any particular year tend to vary widely¹.

The demand for foodgrains in the last year, 1955-56, of the First Five Year Plan period (1951-56)² was estimated at 62 million tonnes on the basis of 13.6 oz. (385 gms) of cereals and 2.2 oz. (62.4 gms) of pulses, or a total of 15.8 oz. (447.4 gms) per adult per day. The actual availability in the terminal year of the First Plan was much higher as the production of foodgrains in 1955-56 exceeded the target and reached 66 million tonnes.

The demand for foodgrains in the last year, 1960-61, of the Second Five Year Plan period (1956-61)³ was estimated at 75 million tonnes on the basis of 15.5 oz. (439 gms) of cereals and 2.8 oz. (79 gms) of pulses, or a total of 18.3 oz. (518 gms) per adult per day in the terminal year. This, in its turn, was based on (a) expected changes in urban population and in (b) per capita income, (c) the need to counter possibilities of inflationary pressures resulting from plan implementation and (d) effects on food consumption of increase in national income and changes in its distribution. The adult consumption, which was 2200 calories in 1955-56, was expected to rise to 2450 by 1960-61. Actual availability in 1960-61 was estimated at 77 to 79 million tonnes or 469 gms of cereals alone per adult per day in 1960-61 both from internal production and imports⁴. The demand for foodgrains in the terminal year, 1965-66, of the Third Five Year Plan (1961-66) was estimated at 101.6 million tonnes on the basis of a normative

¹There are wide differences between B. M. Bhatia's estimates of 'Net Availability of Cereals and Pulses' (source not cited) in the Appendix to his article—Food, Famine and Population in *Population in India's Development*, Delhi, 1974, pp.220-231 and those available in the working and published documents of the Planning Commission and the Ministry of Food and Agriculture. In this circumstance, we have refrained from borrowing Bhatia's attractive time series statistics for the years 1956-1973 and have adhered to government figures in this paper.

²First Five Year Plan, 1952, p.158.

³Second Five Year Plan, 1956, p. 260.

⁴Bulletin Food Statistics (24th issue), 1974, p.183.

demand of 18 oz. (\$10 gms) of foodgrains per adult per day⁵. It was assumed in the Third Plan that this normative demand would be the result of income elasticity of demand. Per capita income would increase at 6 per cent per year. The availability was about 90.7 million tonnes including supplies from imports. Weather in the last year, 1965-66, proved adverse and the country passed through an acute food situation in 1966. During the Third Plan period (1961-66) the country imported 25 million tonnes of foodgrains⁶. According to B. M. Bhatia (see footnote 1), however, the total imports for the five calendar years, 1961-65, were 25.4 million tonnes, 10.34 million tonnes for 1966, the worst drought year, 8.66 million tonnes for 1967, the next worst drought year, 5.69 million tonnes for 1968. The original Draft Fourth Year Plan (1966-71) put the target of production for the terminal year 1970-71 at 129 million tonnes. This was on consideration of prospective growth in population and in per capita income. The total availability of 107.8 million tonnes in 1970-71 including imports fell short of the estimated demand by a considerable margin. The actual availability for 1968-69 was 94 million tonnes and for 1969-70, 99.5 million tonnes. This resulted in almost doubling of wholesale prices during the period 1966-71. The target of production for 1971-72 was set at 112.0 million tonnes⁷.

The Fourth Five Year Plan (1969-74) retained the target of production for the terminal year, 1973-74, at 129 million tonnes. It was assumed that per capita expenditure would go up by 16 per cent and population would increase by 15.7 per cent during the period 1968-69 to 1974-75. The expenditure elasticity would be 0.5⁸. During the Fourth Plan period, however, the increase in per capita income fell considerably short of the target and the lower level of

⁵Approach to Agricultural Development in the Third Five Year Plan: Unpublished Working Paper of the Planning Commission, 1960.

⁶Fourth Five Year Plan, 1970, p.7.

⁷The Fourth Plan Mid-Term Appraisal, 1971, Vol. I, p.9 and Vol. II, p.61.

⁸Fourth Five Year Plan, Chapter 2—The Long Term Perspective, pp.30-31; p.121.

availability led to unprecedented rise in the price of foodgrains. On the other hand, the population count in 1971 registered a level lower than that projected in the 1960's by the Expert Committee on Projections. The actual availability for consumption in 1974 has been estimated at 90.7 million tonnes⁹.

The Draft Fifth Five Year Plan (1974-79) assumed the base level of demand for the year 1973-74 at 114.0 million tonnes and considered the building up of an adequate buffer stock essential. The target of production for the terminal year 1978-79 was fixed at 140 million tonnes. The availability in 1977-78 was estimated at 120 million tonnes, with a buffer stock in hand of approximately 18 million tonnes.¹⁰ The Draft Five Year Plan 1978-83¹¹ estimates a demand for 1982-83 of 140 to 144 million tonnes and expects a similar availability through production in that year. The estimate of output for 1987-88 has been put at 164 to 169 million tonnes. On the basis of as high as 2 per cent growth in population between 1978 and 1988, together with an income elasticity for demand of 0.6, the demand in 1987-88, on a base level of 120 million tonnes in 1977-78, would, however, be less than this figure.

⁹Report of the National Commission on Agriculture, Part III: Demand and Supply, 1977; Chapter 10, p.3.

¹⁰Draft Fifth Five Year Plan, 1974-79; 1974, Vol. II, p.51.

¹¹Draft Five Year Plan, 1978-83; 1978, p.47.

The ease with which the government has been adding to its buffer stock in recent years suggests that the demand for foodgrains has not been increasing as anticipated and that the incentive for greater production has been provided more by the higher guaranteed procurement prices than demand proper. Nonetheless, there must be more to the demand pattern than apparently meets the eye because prices in the open grain market are often higher than the procurement prices. One obvious reason, of course, is that the better quality grain is offered in the open market for which the demand is higher while the inferior quality is offered to government procurement. Nonetheless, the tardiness with which demand for foodgrains has behaved in recent years, especially since 1975, calls for a hard look at the prospects of foodgrains production in the coming years. While the technological impediments to higher agricultural productivity have been identified and are being more and more efficiently attended to, the consumption and distribution pattern of foodgrains will demand more attention in the context of prospective incomes and their distribution.

Population and Food Supply Around 1971

As noted in the Preface, the joint study undertaken by the Centre for the Study of Regional Development, Jawaharlal Nehru University and the Perspective Planning Division of the Planning Commission* on agricultural productivity and growth rates for the period 1962/65 and 1970/73 provides a fortunate occasion to relate some of its findings to the results of the population census of 1971, for the latter can be for all practical purposes related to the triennium 1970/73.

1. Agricultural Productivity and Growth Rates by Districts related to Population, 1971

G.S. Bhalla and his team proceeded on the basis of the money value per hectare of one or several of all the 19 crops (including four non-food crops) that are

grown throughout India. They excluded from their survey all the twelve Union Territories and divided the remaining states into 282 districts as listed in Appendix I in some cases by amalgamating two or more contiguous districts and treating them as one. Their findings are confined to these 282 districts. They arrived at a figure of Rs. 974 as the figure of average productivity per hectare for the country as a whole (282 districts). Brief abstracts of their findings related to the population figures of 1971 are given below in tabular form (Table IV.1).

Table IV.1 summarises the relationship between agricultural output, certain types of agricultural inputs and the size of population in each agricultural productivity level in 1971.

TABLE IV.1
282 Districts of India Graded According to Productivity Measured by the Value of All Crops Grown Per Hectare, Classified by Proportions of Inputs Used and Share of 1971 Population in each Category, 1962-65-1970-73

Category	No. of Districts	Percent of gross cropped area	Percent of output	Percent of fertilizer consumption	Percent of total tractors employed in the country	Percent of total irrigation engines in the country	Percent of total irrigated area in the country	Actual population (Millions)	Percent of total population of the country
TOTAL (2 + 3 + 4)	282	100.00	100.00	100.00	100.00	100.00	100.00	523.55	100.00
1. Districts that are above average productivity of Rs. 974 per hectare	133	46.41	61.27	70.32	66.24	63.80	70.56	306.44	58.53
2. High productivity districts i.e. productivity over Rs. 1400 per hectare	57	20.06	29.92	41.26	44.55	43.45	38.41	136.36	26.05
(a) Productivity over Rs. 1600 per hectare	42	15.86	23.05	35.87	42.73	37.59	32.60	91.46	17.47
(b) Productivity Rs. 1400-1600 per hectare	15	4.20	6.87	5.39	1.82	5.86	5.81	44.90	8.58
3. Mid productivity districts i.e. productivity of Rs. 974-1400 per hectare	76	26.35	31.35	29.06	21.69	20.35	32.15	170.08	32.48
(a) Productivity Rs. 1200-1400 per hectare	27	7.89	9.86	9.34	9.15	7.94	7.44	58.08	11.09
(b) Productivity Rs. 974-1200 per hectare	49	18.46	21.49	19.72	12.54	12.41	24.71	112.00	21.39

*G. S. Bhalla, Y. K. Alagh et. al. *Foodgrains Growth: A Districtwise Survey 1976*; Mimeograph, JNU and Planning Commission.

TABLE IV. 1 (Concl'd.)

Category	No. of Districts	Percent of gross cropped area	Percent of output	Percent of fertilizer consumption	Percent of total tractors employed in the country	Percent of total irrigation engines in the country	Percent of total irrigated area in the country	Actual population (Millions)	Percent of total population of the country
4. Low productivity districts i.e. productivity below Rs. 974 per hectare	149	53.59	38.73	29.68	33.76	36.19	29.44	217.11	41.47
(a) Productivity Rs. 600-974 per hectare	92	31.14	28.18	20.80	26.72	22.09	22.19	155.34	29.67
(b) Productivity below Rs. 600 per hectare	57	22.45	10.55	8.88	7.04	14.10	7.25	61.77	11.80

Source: Foodgrains Growth: A Districtwise Survey 1976, Census of India 1971

From Table IV.1 it is heartening to note that about 136 million or 26 per cent of India's population live in 57 districts which have as high a productivity as over Rs. 1400 per hectare. Of these again, as much as 91 million or 17.5 per cent of India's population live in as many as 42 districts which have a productivity over Rs. 1600 per hectare. These segments of the population can claim to have crossed the technology hump in agriculture in the Indian context, and may be on the way to taking care of their natural rate of population growth, unless they are overwhelmed by large scale immigration. They utilise the largest proportions of fertilizers (41 per cent), tractors (44 per cent) and irrigation engines (43 per cent). They occupy only 20 per cent of the national gross cropped area, but produce 30 per cent of the national output. Productivity in agriculture in these districts and among these populations may well have set in train a wide variety of agro-processing and light industries dependent on agriculture for raw materials and resources.

As many as 170 million or nearly 32.5 per cent of India's population, however, inhabit 76 of India's medium productivity districts, productivity in them ranging from Rs. 974 to Rs. 1400. They occupy 26.3 per cent of the national gross cropped area and produce 31 per cent of the national output. They are behind the top category districts in fertilizer consumption, tractor use and irrigation machines employed, but claim about 32.2 per cent of India's total irrigated area. Their technological capabilities, though much less than those of the top 57 districts, are considerable and 32.5 per cent of India's population or 170 million in absolute numbers can with reasonable confidence face the future. This more or less applies to the 133 districts above the average productivity of Rs. 974 per hectare with a population of 306 million and a share of 59 per cent of the total population of 282 districts. Together, this group enjoys 46 per cent of the national gross cropped area, offers 61 per cent of the

national output, and consumes 70 per cent of all fertilizers, 66 per cent of all tractors, 64 per cent of all irrigation engines and 71 per cent of all irrigated areas. The self-confidence rating of this population to face the future should, therefore, be reasonably high.

On the other hand, as many as 149 districts with a population of 217 million or 41.5 per cent of the total population is characterized by a productivity below the national average of Rs. 974 per hectare. They enjoy about 54 per cent of the national gross cropped area, offer 39 per cent of the national output, consume less than 30 per cent of fertilizers, utilize less than 34 per cent of all tractors, less than 37 per cent of all irrigation engines and less than 30 per cent of all irrigated land.

The size of the population which lives in districts enjoying more than the national average of productivity is, of course, larger than the size of the population living in the districts below the national average of productivity, the ratio of the two respective populations being 306:217. The proportion of gross cropped area, on the other hand, between the two respective categories is 46:54, suggesting that the population and lands in the higher productivity category make up in endowments and benefits what they lack in acreage. It is clear that the distribution of endowments and benefits is disproportionately in favour of the former category of districts.

Map 1 depicts spatial variations in the distribution of high, medium and low levels of agricultural productivity, measured in terms of value of output per hectare. Out of the total of 282 districts studied as per Table IV.1 and Map 1, only (1) 42 districts have very high agricultural productivity per hectare (Rs. 1600 and above), 15 districts show high productivity (Rs. 1400-1600); (2) 27 districts have high medium productivity (Rs. 1200-1400); (3) 49 districts indicate medium productivity (Rs. 974-1200); (4) as many as 93 districts fall in the low productivity category (Rs. 600-974); and (5) 57 districts in very low agri-

cultural productivity (below Rs. 600 per hectare). (See table IV.2 for statewide distribution of such districts). Map 1 and Table IV.2 give the details as follows:

- (1) Out of 42 very high productive districts, 9 districts lie in Punjab, 1 district in Haryana, 5 in Uttar Pradesh, 3 in West Bengal, 5 each in Karnataka and Kerala, 4 in Andhra Pradesh, 7 in Tamil Nadu and 1 in Gujarat. That is, very high productivity districts occur both in wheat-rich and rice-rich regions. Bihar, Orissa, Madhya Pradesh and Maharashtra have none of the very high productive districts.
- (2) Of next importance, high productivity districts, totalling only 15, are more sparsely distributed. In general, they appear contiguous to the first category of districts.
- (3) Out of 27 high medium productivity districts, most of them lie in West Bengal (7), Uttar Pradesh (4), Karnataka (3) and in Assam (3) and in a few

scattered patches in Punjab (2), Haryana (2), Gujarat (2), Bihar (2), Andhra Pradesh (1) and Tamil Nadu (1).

- (4) Twentyone districts out of a total of 49 medium productivity districts appear in Uttar Pradesh alone, and 6 districts each in Bihar and Orissa. The rest of the districts in this category are scattered all over India; Karnataka (5), Gujarat (2), Assam (2), Andhra Pradesh (1), Haryana (1), Madhya Pradesh (1) and Tamil Nadu (1).
- (5) Out of 92 low productivity districts, as many as 25 districts lie in Madhya Pradesh, 19 districts in Uttar Pradesh, 12 districts in Rajasthan and 11 districts in Gujarat. These four states, especially the first three, pose problems of very low agricultural productivity per hectare, because the lowest category of productivity also recur in these states (Rajasthan-14, Madhya Pradesh-17, Maharashtra-18, and Gujarat-2).

TABLE IV.2
Spatial Distribution of Agricultural Productivity Levels
(Rupees per Hectare)

Agricultural Productivity Level (Rupees per hectare)	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Jammu & Kashmir	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Rs. 1600 and above	4	-	-	1	1	-	5	6	-	1	-	9	-	7	5	3	42
Rs. 1400-1599	1	2	-	-	-	1	1	1	-	2	-	-	-	2	1	4	15
Rs. 1200-1399	1	3	2	2	2	-	3	-	-	1	-	2	-	1	4	6	27
Rs. 974-1199	1	2	6	2	1	-	5	-	2	1	6	-	-	1	21	1	49
Rs. 600-973	7	-	7	11	2	1	3	-	24	3	5	-	12	-	17	-	92
below Rs 600	3	-	-	2	1	-	2	-	17	18	-	-	14	-	-	-	57
Total of 282 Districts	17	7	15	18	7	2	19	7	43	26	11	11	26	11	48	14	282

Source: As in Table IV.1.

On reviewing the picture statewide, Punjab fares best (9 out of a total of 11 districts belong to very high productivity level), followed closely by Kerala (5 out of a total of 6) and by Tamil Nadu (7 out of a total of 11). The situation of Karnataka (5 out of a total of 19) and of Andhra Pradesh (4 out of a total of 17) is not bad. Nor is the situation of West Bengal, Assam and Haryana discouraging. But the worst picture emerges for some of the remaining states: Rajasthan (26 out of a total of 26 districts belong to low productivity level), Madhya Pradesh (42 out of a total of 43 districts), Maharashtra (21 out of a total of 26 districts), Gujarat (13 out of a total of 18 districts), Andhra Pradesh (10 out of a total of 17

districts) and of Bihar (7 out of a total of 15 districts). Enhancing the level of agricultural productivity in these states (total of 149 districts out of a total of 282) will demand the serious attention of our planners.

2. Agricultural Growth Rates

Summary Table IV.3 distributes the 282 districts by growth rate of crops between 1962-65 and 1970-73. The average agricultural growth rate during this period was 1.94 per cent per annum. Of the 282 districts, 70 showed negative growth rates (or decline) during the period, of which again as many as 22 districts showed negative growth rates (or decline) of - 3 per cent or more per annum.

TABLE IV.3

282 Districts Classified by Agricultural Growth Rates per Annum (1962-65 to 1970-73), Proportions of Inputs Consumed and Share of 1971 Population in each Category

Category	Number of Districts	Per cent of national gross cropped area	Per cent of total national output	Per cent of total national fertilizer consumption	Per cent of total tractors employed in the country	Per cent of total irrigation engines employed in the country	Per cent of total irrigated area in the country	Total population of districts in each group (million)	Per cent share of population of each category to total
A. High growth rate over 4.5 per cent per annum per hectare	48	18.68	23.04	26.89	54.46	25.50	32.56	70.40	13.45
(a) Growth rate higher than 6 per cent per annum	@25	10.51	12.45	16.39	37.37	13.81	19.26	30.64	5.86
(b) Growth rate between 4.5 and 6 per cent per annum (average 5.07)	*23	8.17	10.59	10.50	17.09	11.69	13.30	39.76	7.50
B. Medium growth rate (1.5 to 4.5 per cent per annum per hectare)	102	33.47	36.48	31.64	23.92	24.36	32.93	183.11	34.97
C. Low growth rate (0 to 1.5 per cent per annum per hectare)	62	21.07	21.77	24.09	12.42	31.00	18.59	127.73	24.40
D. Negative growth rate (below 0 per cent per annum per hectare)	70	26.78	18.71	17.38	9.21	19.15	15.91	142.30	27.18
(a) Negative growth rate (below -3 per cent per annum per hectare)	22							42.35	8.09
TOTAL	282	100.00	100.00	100.00	100.01	100.01	99.99	523.55	100.00

Note: @All the 25 districts had much lower productivity than the all-India average during 1962-65.

Yields went up to 721 kg. per hectare during 60's and to 1138 kg. per hectare during 70's.

*These 23 districts were higher productivity districts to begin with.

Source: G.S. Bhalla, et. al., *Foodgrain Growth: A Districtwise Survey*, 1976; Mimeograph, Table 5(a) & 5(b).

The 48 districts in the first category A (Table IV.3) enjoyed 17 per cent of gross cropped area in the country. Of the 25 districts in category A(a), those that are in Rajasthan (8), Western Uttar Pradesh (2), Karnataka (2) saw spectacular progress in flow and tubewell irrigation. In the 11 districts of Punjab in this category, irrigation increased from 57.7 per cent in 1962-65 to 76.1 per cent in 1970-73. All the 23 districts in category A(b) of Table IV.3 were high productivity districts to begin with in 1962-65. The 102 districts in category B account for nearly one-third (33.47) of the gross cultivated area of the country producing slightly more than one-third (34.46) of the total output. These districts determine the overall growth pattern of agricultural output in the country. It is in these districts that the process of change is embedded and is also crucial. In the 62 districts in category C, the proportion of area irrigated is comparatively small while the use of fertilizers is proportionately high, indicating the need of re-education and re-adjustment of technological mix. All the 70 districts in category D enjoy no more than 16 per cent of all irrigated area in the country and use as

little as 7 per cent of fertilizers, 9 per cent of tractors and 19 per cent of irrigation engines. These, according to Bhalla's classification, must be the real problem districts in agriculture.

When the rates of growth of agricultural production are related to population in the respective categories of districts, Table IV.3 yields an even bleaker message than that of productivity. Thus, only 25 districts with a population of 30.64 million or a percentage share of 5.86 of India's total population enjoyed the highest average growth rate of 7.82 per cent. But, although showing high growth rates, they still suffer from low yields and therefore do not throw their full weight into the picture of confidence. But there were 23 districts with a population of about 40 million, with a share of 7.6 per cent of India's population, which can claim to face the future with greater confidence. There were as many as 102 districts in category B with a population of 183 million or 35 per cent of the total population with a medium agricultural growth rate of 1.5 to 4.5 per cent per annum. There were as many as 62 districts in category C with a population of 128 million or a share of 24.4 per cent in India's population

with a low agricultural growth rate of 0 to 1.5 per cent. Be it said in extenuation, however, that their share of consumption of inputs is not all that depressing: they are, therefore, gathering the potential of growth.

The truly depressing part of the picture in Table IV.3 is category D, which shows the continuance of as many as 70 districts with a population of 142 million or 27 per cent of India's population, with a negative or declining agricultural growth rate. What is even more distressing about category D is that as much as 27 per cent of the national gross cropped area falls in this category contributing only 19 per cent of the total national output. The share of consumption of fertilizers and tractors is very low, but the picture of irrigation share (16 per cent) is brighter. In this category D again, as many as 42.3 million population with a share of 8.1 per cent of India's total population reside in 22 districts where the negative growth rate goes below -3 per cent per hectare. This represents an extreme situation.

The legitimate conclusion that follows is that not more than 46 per cent of the gross cropped area in as few as 133 districts contributing slightly over 61 per cent of the total output in India has reached a productivity level of Rs. 974 per hectare and above, while as many as 149 districts commanding 54 per cent of the gross cropped area producing only about 39 per cent of the output still belong to the very low productivity category below Rs. 974 per hectare. Besides, the problems of administration, management, extension and development of institutional and infrastructural facilities in as many as 149 districts, where the level of their efficiency and performance is undoubtedly poorer than in the 133 more-than-average-productivity districts, will demand redoubled attention and reinforcement of effort. It is here that the battle for the absorption of net population growth in the future will be crucial and difficult.

TABLE IV.4
Spatial Distribution of Districts by Rate of Growth of Output (1962-65 to 1970-73)

Output growth (Comp. Ann. %)	Rajasthan	Punjab	Haryana	Karnataka	Uttar Pradesh	Jammu & Kashmir	Gujarat	Tamil Nadu	Assam	Madhya Pradesh	West Bengal	Bihar	Kerala	Andhra Pradesh	Maharashtra	Orissa	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Above 6.0	8	11	2	2	2	-	-	-	-	-	-	-	-	-	-	-	25
4.5-6.0	4	-	3	2	6	2	4	2	-	-	-	-	-	-	-	-	23
3.0-4.5	2	-	2	2	10	-	2	2	1	6	4	2	1	-	-	-	34
1.5-3.0	6	-	-	2	18	-	3	2	3	18	8	3	3	2	-	-	68
0.0-1.5	4	-	-	5	11	-	5	5	3	12	1	3	3	4	3	3	62
-1.5-0.0	-	-	-	5	1	-	2	-	-	5	1	4	-	6	5	8	37
-3.0-1.5	1	-	-	1	-	-	1	-	-	1	-	2	-	2	3	-	11
Less than -3.0	1	-	-	-	-	-	1	-	-	1	-	1	-	3	15	-	22
Total 282 districts	26	11	7	19	48	2	18	11	7	43	14	15	7	17	26	11	282
Region above average (Average 1.94)	18	11	7	7	29	2	7	5	3	20	11	4	3	1	-	-	128

Source: G. S. Bhalla et al. As in Table IV.3.

Map 2, read with Table IV.4, shows spatial variations in the agricultural growth rates in India during the period 1962-65 to 1970-73. Out of a total of 282 districts, for which data were available, only 25 districts recorded growth rates above 6 per cent per annum. Most of them lie in Punjab (11) and Rajasthan (8) and only 2 districts each appear in Haryana, Karnataka and Uttar Pradesh. Of these, Punjab enjoys a singularly privileged position, for all of its districts show very high growth rates.

Twentythree districts in all enjoy growth rates ranging from 4.5 per cent to 6.0 per cent, most of which make contiguous geographical clusters around the districts of the former category of high growth rates. By themselves, they do not display any clear-cut spatial pattern in their distribution, although they bear out the spread effect of the very high growth rate districts. These two categories can be termed as high growth rate districts, totalling 48.

Thirtyfour districts register growth rates between 3.0 per cent and 4.5 per cent, a little less than a third of which are located in Uttar Pradesh (10), closely followed by Madhya Pradesh (6) and West Bengal (4). The majority of these districts form distinct contiguous geographical clusters. The remaining high medium growth rate districts are scattered all over northern and southern India.

As many as 68 districts record a growth rate ranging between 1.5 per cent and 3.0 per cent. These may be called low medium growth rate districts. Uttar Pradesh and Madhya Pradesh, each having 18 such districts, make a conspicuous cluster of districts of low medium growth rates. Other such districts are scattered all over India: Rajasthan (6), West Bengal (8), Bihar (3), Kerala (3), Andhra Pradesh (2), Tamil Nadu (2), Karnataka (2) and Gujarat (3).

Low agricultural growth rate (ranging between 0 to 1.5 per cent) appears over 62 districts, most of which emerge spatially contiguous to the category last mentioned. Again, as many as 11 districts of Uttar Pradesh and 12 districts of Madhya Pradesh show low agricultural growth rates. Excepting Punjab, Haryana and Jammu & Kashmir, all the remaining 14 states of India have 3 or 4 such districts of low growth rates.

Negative growth rates or declines (0 to -4.5 per cent) appear in 70 districts out of a total of 282. Of them, as many as 23 districts emerge in Maharashtra alone, and 11 such districts lie in Andhra Pradesh, 8 in Orissa, 7 in Madhya Pradesh, 7 in Bihar, 6 in Karnataka, 4 in Gujarat, 2 in Rajasthan and only one each in Uttar Pradesh and West Bengal. Thus, in spite of impressive agricultural investments since 1950, Maharashtra stands out as a problem state, both in terms of negative agricultural growth rates and in productivity per hectare. Orissa has as many as 8 districts out of a total of 11 suffering from negative growth rates, all between 0 and -1.5. Andhra Pradesh with as many as 11 out of a total of 17 districts suffers from negative growth rates, which go below -3.0 per cent. The next place is shared by Bihar and Madhya Pradesh with 7 districts each out of a total of 17 and 43 respectively suffering from negative growth rates. Tamil Nadu, Assam, Kerala and Jammu & Kashmir along with Punjab and Haryana are the only states which do not have any district suffering from the stigma of a negative growth rate. Rajasthan has two districts with bad negative

growth rates. Karnataka has five districts with a small negative growth rate and one with bad negative growth rate. Gujarat has two districts with a small negative growth rate and as many as 2 with bad negative growth rates.

Growth rates, as we have seen, are to be distinguished from productivity levels. In the period under consideration, as we have noted in Table IV.3, it is often the districts with a low productivity base that registered promising growth rates. There are plenty of districts where a comparatively high productivity level base registered low or even negative growth rates. While the former set bears testimony to human enterprise and technological and other inputs, the latter set may well cause anxiety as to the impediments, both institutional and technological, that may be blocking further progress.

3. Concentration of Land Ownership (1971) and Levels of Agricultural Productivity (1970)*

As indicated earlier, we have attempted this analysis at two levels of aggregation and disaggregation: (1) at six levels of agricultural productivity, and (2) at level of the district (numbering 282). The latter analysis was considered necessary because the findings at the former level were not always yielding results of policy significance. First, we shall describe the results of the analysis that was performed at the six productivity levels. Secondly, the preliminary findings from the analysis made at the district level.

It has been one of our purposes to assess whether or not inequalities in the distribution of land ownership create or induce malnourishment in India. For this purpose, Gini ratios of concentration of land ownership for 1971 were calculated for groups of districts in each of the six levels of agricultural productivity.

Table IV.5 presents the Gini concentration ratios of land ownership at the six levels. Higher inequality in land ownership occurs in both the highest and in the levels of medium productivity (levels 1 and 3). On the other hand, lowest inequality in land ownership emerges in both high level of agricultural productivity (level 2) and the lowest level of productivity (level 6). There is hardly any statistical hierarchical relationship between the two.

Chapter and other related data. L. P. Pathak, S. B. L. Sherry, both Research Officers, Nirmala Nanda, Research Associate and S. Parvathi of the Project also assisted substantially in the calculation.

* Lokenath Ray, Research Associate, has been mainly responsible for detailed calculation of Gini concentration ratios of all the 277 districts of India, preparation of Gini curves, Tables 1 and 2 of this

TABLE IV.5
Gini Concentration Ratios of Land Ownership
Cross-classified by Agricultural Productivity Levels

	Agricultural productivity level (Rupees per hectare)	Gini concentration ratio of land ownership (1971)	Total number of districts
I	Rs. 1600 +	0.723	40
II	Rs. 1400-1600	0.558	15
III	Rs. 1200-1400	0.746	26
IV	Rs. 974-1200	0.718	49
V	Rs. 600-974	0.694	92
VI	Below Rs. 600	0.491	55

Note: For lack of data Gini ratios could not be estimated for 4 districts (Greater Bombay—Level I, Shahabad—Level III, Bhandara and Baudh-Khondmals—both level VI). A single Gini estimate was made for clusters of districts of Ernakulam—Kottayam and Kozhikode—Malappuram—Palghat all in level I. These districts when added to 277 districts for which Gini ratios could be calculated make a total of 282 districts selected for study.

Source: Agricultural Census of India, 1971; Ministry of Agriculture and State Department of Agriculture.

These observations are also reinforced by Charts 1 and 2 which depict the Gini concentration curves for each of the six agricultural productivity levels. At first, it appears that high concentration or high inequality in land ownership occurs in the very high agricultural productivity level (level 1) and low inequality appears in the low agricultural productivity level (level 6), but the picture soon gets modified as both high and low inequality emerge in both high and low agricultural productivity levels (levels 2, 3, 4 and 5). A clear, unequivocal conclusion could not be drawn from this type of aggregated data.

This may appear as a very surprising finding. The absence of any positive or negative relationship between acute inequality in land ownership pattern, on the one hand, and high or low levels of agricultural productivity, on the other, might mean that high agricultural productivity might occur in spite of present-day inequitous distribution of land ownership. It might even gladden the hearts of protagonists of anti-land reforms. But the reality may be different. The use of gross aggregated data grouped at the agricultural productivity levels is apt to conceal the real message. It is our contention that a more minute level study, using fine-grained data at the level of the district or taluka, or even the village or individual plots, would be necessary before we can arrive at a decisive conclusion about the relationship between land ownership pattern and the levels of agricultural productivity. Besides, data on land ownership in the 1971 Agricultural Census, being culled mainly from existing land records at the village level, may themselves be defective and reflecting a situation removed from the actual realities. Finally, it is a matter of serious debate, as we shall observe later, whether the Gini ratio itself is an adequate measure for our purposes of comparing inequalities and their effects.

Table IV.5 also conceals other dimensions and processes which cannot be disentangled without a detailed study of fine-grained data. For instance, high level productivity which occurs in level 1, in spite of unjust land distribution, owes its success to the fact that all the major agricultural investments and inputs (like fertilizers, tractors, pump sets, irrigation channels) are usurped by big land holdings; this helps to maintain a high level of agricultural productivity despite inequality in ownership pattern. Rather it strengthens the forces of social injustice with a concentration of land ownership and productivity in a few hands. Curiously enough, high inequitous land ownership pattern also emerges in the 5th or the last but lowest level of agricultural productivity. Ninetytwo districts out of a total of 282 belong to this category. We can recognise a totally different process operating here. High inequality in land ownership is coupled with very low productivity per hectare. This may mean that very little of agricultural investments and inputs really have gone into this category. Even the bigger landowners do not have adequate access to them. Production is low and fragmentation of holdings continues unabated. This is further scrutinised with the data at the district level.

4. Spatial Distribution of Gini Ratios (District-level)

Gini ratios of concentration of land ownership were further calculated for each of the 277 districts for which data were available (see Map 3). Table IV.6 presents a statewide distribution of districts with high inequality (Gini ratios above 0.601), medium inequality (0.501 to 0.600), low inequality (0.401 to 0.500) and very low inequality (less than 0.400) in the distribution of land ownership in India. Out of a

total of 277 districts studied, 44 districts show very high inequality in land ownership, as many as 156 districts belong to medium inequality, and 77 districts register relatively less inequality.

High inequality districts appear mostly in Bihar (10), Madhya Pradesh (9), Andhra Pradesh (6), Uttar Pradesh (5) and Rajasthan (4). One or two such districts also lie in Assam, Gujarat, Karnataka, Kerala, Maharashtra, Punjab and Tamil Nadu. The thing to be noticed here is that highly inequitable districts neither emerge in the highly productive states of Punjab or Haryana, nor in the very low productive states of Maharashtra or Uttar Pradesh. That is, there is no one-to-one relationship between high/low productivity level (or growth rates) and high/low concentration in land ownership. We shall examine this aspect in more detail in later chapters.

Medium inequality in land ownership appears in more than half of the total districts selected for study (156 out of 277). Here, Uttar Pradesh (41 districts out of a total of 48), Madhya Pradesh (28 out of 43), Karnataka (10 out of 19), Rajasthan (15 out of 26), Andhra Pradesh (11 out of 17), Punjab (8 out of 11) and Maharashtra (9 out of 24) indicate quite substantial degrees of inequitable distribution of land ownership.

Only 77 districts, out of 277 studied, indicate relatively low inequality in land ownership. West Bengal tops in this respect for its 11 districts (out of 14), followed by Gujarat (15 out of 18), Orissa (7 out of 10), Maharashtra (12 out of 24), and Karnataka (8 out of 19). All other states have one or two districts each in this category.

It is worth noting that high inequality in land ownership appears in Bihar and Madhya Pradesh which are low productivity zones, but low inequality also emerges in those districts which are low productivity zones such as in West Bengal, Kerala, Karnataka or Gujarat. High productivity zones of Punjab and Haryana enjoy only medium inequality in land ownership. The crucial question of whether or not high inequality in land ownership retards or accelerates agricultural productivity or growth rates remains unanswered, at least in this stage of analysis.

However, we shall further examine this matter through a district level analysis (where districts are considered as independent units of observations without grouping them according to six productivity levels), and employing correlation-regression techniques. That analysis will have, as we shall see in chapters VI and IX, several important messages to convey.

TABLE IV.6
Spatial Distribution of Gini Ratios of Concentration of Land Ownership
(District Level)

Gini coefficient (concentration of land ownership)	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Himachal Pradesh	Jammu & Kashmir	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0.601 and above	6	2	10	1	-	-	-	1	1	9	3	-	1	4	1	5	-	44
0.501-0.600	11	4	4	2	7	-	1	10	3	28	9	3	8	15	7	41	3	156
0.401-0.500	-	1	-	12	-	-	1	8	2	6	12	6	1	7	2	1	10	69
0.201-0.400	-	-	-	3	-	-	-	-	-	-	-	1	1	-	1	1	1	8
Total of 282 Districts	17	7	14	18	7	-	2	19	6	43	24	10	11	26	11	48	14	277

Notes: 1. Data not available for 1. Shahabad (Bihar), 2. Baudh-Khondmals (Orissa), 3. Bhandara (Maharashtra), 4. Greater Bombay (Maharashtra).
2. Land ownership data for clusters of districts of Kottayam—Ernakulam, and Kozhikode—Malappuram—Palghat (all in Kerala) were not available separately; these districts were amalgamated.

Source: As in Table IV.5.

5. Surplus and Deficit Districts in 1971 Assessed on the basis of Cereals and Pulses Requirements alone in the Diet*

It is important at the outset to explain the limitations of this exercise. No attempt has been made to determine surplus or deficit districts by recommended allowances of groups of nutrients, namely, carbohydrates, fats, proteins, minerals and vitamins. Nor has any allowance been made for the fact that the amount and proportion of each in diets vary with age, sex, body weight, occupation and ambient temperature. The dietary habits of normal healthy people in different parts of the country and among different ethnic groups, their total food intakes and the proportions of ingredients in total intake, reveal significant differences. To that extent the uniform norms of desirable cereals and pulses requirements assumed in this exercise for the country as a whole, irrespective of regions, communities and cultures, are untenable. In the next place, this exercise does not take into account foods that are locally available and enter into the common diet, often unpaid for or unaccounted in diet or consumption surveys, like fish and homegrown tapioca, coconut or fruit or vegetables, or even those local foods, most often rightly chosen, which have an economising effect on the food budget. The exercise does not go into the question of availability or requirements of vegetables, fats and oils, milk and other animal foods. Nor does the study attempt to determine how much of the surplus protein in the diets of communities in different parts of the country is broken into for meeting calorie deficiency. On account of difficulties in choosing the right year of reference and in allocating food values between the intake of cereals and pulses on the one hand and oils and fats, sugar etc. on the other, we have not found, for this districtwise exercise, the NSS consumption surveys series readily tractable, particularly for the purpose of allocating districts to NSS zones, although the level of disaggregation of data in the NSS surveys is much more attractive.

On the other hand, the exercise begins by assuming that the requirements of cereals for the entire population throughout the country and by the age-sex biological groups defined for this study will be uniform. It makes a virtue of necessity—data for other ingredients being not so readily available for purposes of disaggregated study—by sticking to cereals and pulses requirements alone, as though cereals were the only

important thing for diet and nutrition. This study relies rather heavily on the argument that what is more important in the Indian situation of a legume culture is the adequacy of calories rather than of proteins. It therefore attempts to find answers only in terms of cereals and pulses intakes and requirements for particular age-sex biological groups. An even more serious and questionable assumption is that all cereals and pulses have been taken as equal, first, because no data was available, district by district, as to the relative shares of wheat, rice, millets and maize in the total production and, secondly, because no satisfactory standardised conversion factor in terms of rice could be worked out for other cereals. Thus, what has been largely ignored in this exercise is the implications of Table IV.7.

Nonetheless, we thought that the conclusions emerging from even such a limited and in some ways misleading exercise as this one would still have significant messages for understanding in outline the geography of adequacy and hunger and, indirectly, of nutrition and malnutrition at the district level in this country on the basis of availability and requirements of cereals and pulses alone on hypothetical all-India standard norms for age-sex biological groups, and, what is of even greater importance, of the dimensions of regional or area planning, allocation, administrative and institutional organisation and management, and particularly of extension work that await to be undertaken. Keeping in mind the limited scope of this exercise and the qualifications, as explained above, that any conclusion would be subject to, an estimation was undertaken of the daily per capita food consumption required for balanced diet for five broad age and biological groups on all-India basis. These five population sub-groups are: (i) children below age 15 years; (ii) adult males, age 15 years and above; (iii) currently pregnant adult females, age 15 years and above; (iv) currently lactating adult females, age 15 years and above; and (v) other adult females who are currently not pregnant and not lactating. The basic data for this estimation has been taken from *Diet Atlas of India* published by the Indian Council of Medical Research¹. For this estimation, only the main foodgrains, like cereals and pulses which form the bulk of the average Indian diet, have been considered. Consumption of fats and oils (groundnuts, oil seeds) and of sugar and jaggery (sugar-cane) have not been taken into account, as very little information is available on their conversion factor (from the stage of a crop to actual intake as a part of the diet). In recent years, again, the availabil-

*Credit is due to Karunamoy Subuddhi, Research Associate, for his assistance in the calculation of food deficit and food surplus. He was primarily assisted by V. S. Gahlaut, M. C. Sharma and Brahm Dutt.

¹C. Gopalan, et al., *Diet Atlas of India*, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, 1971.

ity of these crops has heavily depended upon import and export fluctuations. Table IV.7 presents the details of estimation of foodgrains required for sustenance by five different population subgroups. According to the current diet habits of the Indian population and according to the availability of the foodgrains supply in the country, it has been broadly estimated that each child of age below 15 years requires on an average 288 grammes of foodgrains intake daily. According to the Diet Atlas, the age group 15-18 is supposed to consume 451 gms. But

we have here considered two main age groups 0-14, 15 and above, on the assumption that since an overwhelming proportion of boys and girls of the ages 15-18 work for their livelihood, their consumption ought to be closer to the adult mark than the adolescent mark. In addition, a considerable proportion of boys and girls aged 10-14 also work almost full time for a living. It would, therefore, be only fair to weight this additional consumption on the age group 15-18 and amalgamate it with adult populations.

TABLE IV.7.
Average Calorie Intake and Population of Different States

State	1971 Population (000)	Average calorial intake	Diet based on	Staple production
Andhra Pradesh	43,503	2,040	Rice	Rice
Assam	14,958	—		
Bihar	56,353	1,865		
Orissa	21,945	—		
Tamil Nadu	41,199	1,498		
West Bengal	44,312	1,927		
Manipur	1,073	—		
Meghalaya	1,012	—		
Nagaland	516	—		
Tripura	1,556	—		
Union Territories	6,342	—		
TOTAL	232,769	1,832 (mean)		
Uttar Pradesh	88,341	2,307	Wheat	Wheat
Punjab	13,551	2,832		
Himachal Pradesh	3,460	—		
Jammu & Kashmir	4,617	2,265		
TOTAL	109,969	2,468 (mean)		
Gujarat	26,697	1,612	Millets & Wheat	Millets & Wheat
Haryana	10,037	—		
Karnataka	29,299	2,220		
Madhya Pradesh	41,654	2,779		
Maharashtra	50,412	2,281		
Rajasthan	25,766	2,044		
TOTAL	183,865	2,187 (mean)		
Kerala	21,347	1,842	Rice and Tapioca	Rice and Tapioca

Source: Report of the National Commission on Agriculture, 1976, Part II. Policy and Strategy; Chapter 9—Nutrition; Table 9.8, p. 146.

Hence in Table IV.8 the proportion of 7.95 for age group 15-18 has been distributed between adult males and adult females according to their proportion in the adjusted age distribution of 1961 population for India. In other words, the figure of 7.95 in col. 2 for boys and girls aged 15-18 has been incorporated

once again in two component parts (a) Adult males; (b) Non-pregnant and non-lactating adult females. Thus, each adult male, age 15 years and above, requires about 574 grammes of foodgrains, each currently pregnant adult woman requires at least 481 grammes, each currently lactating adult woman needs at least

541 grammes, and each non-lactating or non-pregnant adult woman requires at least 431 grammes. These figures are the minimum amount of foodgrains required daily per caput for the barest sustenance, below which level malnutrition may set in. These indicate the foodgrains needs of average persons. No refinement has been made for hard manual workers,

or ailing persons or growing persons in the early years of adulthood. It is curious to note that, even according to the norms of the Indian Council of Medical Research, the food requirements of a pregnant or lactating mother (whose nutrition requirement one would imagine should be more) is supposed to be definitely less than that of an adult male.

TABLE IV.8
Estimates of Daily Average Indian Balanced Diet Required
(in grammes)

Age/sex Groups	Percentage of population	Vegetarian (28.4%)			Non-vegetarian (71.6%)			Average foodgrain required		
		Cereals	Pulses	Total food- grains	Cereals	Pulses	Total food- grains	Cereals	Pulses	Total food- grains
Pre-school children										
0-3 Years	13.607	150	60	210	150	40	190	150	46	196
4-6 Years	8.47	200	60	260	200	50	250	200	53	253
School children										
7-9 Years	7.674	250	70	320	250	60	310	250	63	313
10-12 Years	7.00	320	70	390	320	60	380	320	63	383
Boys and Girls										
13-14 Years	4.33	395	70	465	395	50	445	395	56	451
15-18 Years	7.95	395	70	465	395	50	445	395	56	451
All children										
0-14 Years	41.08	234	65	299	234	50	284	234	54	288
Adult Males	30.614	508	77	585	508	62	570	508	66	574
Adult Females	28.296	375	67	442	375	52	427	375	56	431
Allowance for:										
Pregnancy	4.2	50	—	50	50	—	50	50	—	50
Lactation	6.1	100	10	110	100	10	110	100	10	110
Non-pregnant and non-lactating adult females	17.996	375	67	442	375	52	427	375	56	431
Pregnant Females	4.2	425	67	492	425	52	477	425	56	481
Lactating Females	6.1	475	77	552	475	62	537	475	66	541

Source: Estimated from C. Gopalan, et. al.; *Diet Atlas of India*. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, 1971, pp. 99-101.

Note: The percentage of population in each age group was assumed to be the same as that of the all-India population in 1961. The data from 1961 census were used for this purpose, vide *Census of India, 1961, Age Tables*, paper 2 of 1963, part II, section II, Adjusted population by single year of age, p. 35. For the first six age groups the corresponding figures given in *Diet Atlas of India* were respectively 9.2%, 9.9%, 8.3%, 8.0% and 10.9% (for 13-18 years) which did not tally with the proportions given in the *Census Age Tables, 1961*, and as such were not considered here.

Converted into estimates of annual requirements of foodgrains, the figures come to: a child—105.12 kg. per year; an adult male—209.5 kg. per year; a pregnant woman—175.6 kg. per year; a lactating woman—197.5 kg. per year; and other adult woman—157.3 kg. per year. Here again, since the ungraduated age-sex distribution of the 1971 census would have the danger of yielding unjustifiable variations in ratios from district to district, because of the unreliability

of crude age returns, the graduated time series of age sex structure for the state in which each district is situated, as worked out by S. B. Mukherjee², was adopted as a more dependable distribution. For each state, the percentages of male children aged 0-14 to total males and of female children aged 0-14 to total females were worked out. These percentages were

²S. B. Mukherjee; *The Age Distribution of the Indian Population*, East-West Center, Honolulu, 1976; Table 5, pp. 97-125.

applied to the male and female populations of each district to work out the population of adult males and 0-14 males and adult females and 0-14 females. Thereafter, relying on the Indian Council of Medical Research's *Diet Atlas of India*³, a uniform all-India figure of 4.2 as the percentage that pregnant women bear to all adult females was applied to the derived figure of adult females for each district. Similarly, a uniform all-India figure of 6.1 as the percentage that lactating women bear to all adult women was applied to the derived figure of adult females. The population of 'other' adult females was derived by subtracting the derived populations of pregnant and lactating females from the derived all adult figures of females in a district.

The total foodgrains demand was thereafter calculated as follows:

1. Total children (0-14) × 288 gms × 365 days
2. Total adult males × 574 gms × 365 days
3. Total pregnant women × 481 gms × 365 days
4. Total lactating women × 541 gms × 365 days
5. Total 'other' adult women × 431 gms × 365 days

The total of the requirements of the five population sub-groups provides an index of total food demands in a district. Estimates of foodgrains demand were thus constructed for each of the 281 districts as in

Appendix I.

Next, the average output of foodgrains available from the major nine food crops (only cereals and pulses) in a district obtained from the Bhalla-Alagh Study provided an estimate of foodgrains availability. Since our estimates of foodgrains demand were based on the population figures of the 1971 census, the estimates of foodgrains supply or availability were similarly based on the triennium production averages of 1970-73 of the Bhalla-Alagh Study.

In the next place, the differences between average foodgrains production in a district and the total foodgrains required in that district were calculated for each of the 281 districts. This provided estimates of districts surplus or deficit in foodgrains. If the amount of foodgrains availability happened to be greater than the foodgrains demand, the district was rated surplus. If, on the other hand, the amount of foodgrains demand happened to be greater than the foodgrains available from production, the district was rated deficit. These estimates of food surplus and deficit provide a measure of nourishment and malnutrition in India at the district level, within the reservations made in the earlier paragraphs of this section.

TABLE IV.9

Levels of Agricultural Productivity showing (a) Number of Districts and Total Annual Average Foodgrains Production (in tonnes) in each Level, (b) the Number of Districts Surplus in Foodgrains and the Amount of Surplus in tonnes, (c) the Number of Districts Deficit in Foodgrains and the Amount of Deficit in tonnes, 1971

Level of agricultural productivity per hectare	Total number of districts	No. of districts surplus in foodgrains	Food Surplus (tonnes) 1971	No. of districts deficit in foodgrains	Food deficit (tonnes) 1971	Net Surplus (+) Deficit (-)
I Rs. 1600 & above	41	29	9,152,981	12	2,074,259	+ 7,078,722
II Rs. 1400-1600	15	8	1,148,051	7	1,640,372	- 492,321
III Rs. 1200-1400	27	17	1,743,343	10	1,430,631	+ 312,712
IV Rs. 974-1200	49	33	4,034,672	16	813,922	+ 3,220,750
V Rs. 600-974	92	64	6,937,494	28	2,910,912	+ 4,026,582
VI Less than Rs. 600	57	29	2,021,211	28	2,715,117	- 693,906
TOTAL	281	180	25,037,752	101	11,585,213	+ 13,452,539

Note: The estimate of foodgrains production for 1971, obtained from 1970/73 triennium calculation of annual averages of districtwise production given in Appendix I, tallies with the estimates of net production of 94.87 million tonnes of foodgrains for 1971, as given in the Finance Ministry's Pre-Budget Economic Survey of 1974-75 (Table 1.9, page 69). Appendix I gives an account of the production in 1971 of 282 districts or rather 282 + 13 = 295. If to the total production of 92.033 million tonnes the production of the remaining 48 districts, left out of account in the Bhalla-Alagh Study, were added, the total of 94.87 million tonnes in 1971 would be reached.

³C. Gopalan et al., *Diet Atlas of India*: ICMR, 1971, p.98. The period of lactation of an average Indian mother was assumed to be two years. As such, the population in the age group 0-2 years was taken as an estimate of the total number of lactating women in

the population. Similarly, in estimating the number of pregnant women, the birth rate in the year 1961 was used. These figures come to 6.1 and 4.2 per cent respectively of the adult female population.

Appendix I* classifies the 281 districts (explained below in the sub-section for districts surplus in foodgrains) by the six levels of productivity and gives for each district (1) the total population in 1971; (2) the rate of agricultural growth for 19 crops taken as a whole from 1962/65 to 1970/73; (3) the agricultural productivity per hectare for 19 crops taken as a whole expressed in terms of value in rupees for 1970/73; (4) the total annual production in tonnes of foodgrains (the nine major food crops of cereals and pulses only) in 1970/73; (5) the foodgrains surplus districts together with an estimate in tonnes of the surplus of foodgrains annually produced in 1970/73 after meeting the requirements of the five categories of population as of 1971 as explained above; (6) the foodgrains deficit districts together with an estimate in tonnes of the deficit of foodgrains annually incurred in 1970/73; (7) the Gini Co-efficient of concentration of land ownership as per the agricultural census of the Government of India in 1971 (see Map 3); (8) the averages of NPK fertilizers used per district in 1970/73; and (9) the area irrigated in hectares per district (1970/73).

Table IV.9 is an abstract of Appendix I.

As one might expect, the 41 districts of highest productivity per acre in 1970/73 produced the largest

aggregate net surplus of foodgrains (7.078 million tonnes). Of these again, the 29 districts offering a total surplus of 9.15 million tonnes served as the main food procurement areas of the Government of India. It is, however, important to note that as many as 12 of the highest productivity districts suffered from a net deficit of 2.074 million tonnes of foodgrains on account, no doubt, of the high pressure of rural, semi-rural and urban population on them (see Appendix I for specific districts). Curiously enough, the districts of the second highest level of productivity, numbering 15, present a net deficit of 492 thousand tonnes, 8 districts showing a surplus of 1.14 million tonnes, while 7 others show a deficit of 1.64 million tonnes. The districts in the third highest level of productivity, numbering 27, record a net surplus of only 312 thousand tonnes. On the other hand, districts in the fourth highest level of productivity, numbering 49 (33 surplus districts and 16 deficit), yield a net surplus of 3.220 million tonnes, while the districts in the fifth level of productivity, numbering 92, interestingly enough, yield a net surplus of as much as 4.026 million tonnes. The districts of the lowest productivity, numbering 57, suffer from a net deficit of 694 thousand tonnes.

The following abstract relates the total population of the districts in each level of productivity with the total annual level of production in tonnes.

Level of productivity (as in Table IV.9 above)	Total population, 1971 (million)	Percentage of population of each level to total population	Total annual foodgrains production, 1970/73 (tonnes)	Percentage of foodgrains production of each level to total annual production, 1970-73
I	95.00	18.15	21,323,273	23.17
II	44.90	8.58	6,357,047	6.91
III	58.08	11.09	9,120,985	9.91
IV	111.01	21.20	19,874,479	21.59
V	145.64	27.82	25,597,882	27.81
VI	68.92	13.16	9,759,632	10.60
TOTAL	523.55	100.00	92,033,298	100.00

The table gives an idea of the relationship between population size and agricultural production by levels of production.

The percentage of production is substantially higher than the percentage of population in the highest

level of agricultural productivity. The lead in the fourth and fifth levels is much smaller by comparison. At the other levels, the percentage of population is higher than the percentage of agricultural production.

*Giriraj Singh, Research Associate, collected all the data in Appendix I which was processed by a team. He was assisted by Ilina Sen.

A. Spatial Distribution of Districts Rated Surplus in Foodgrains

In this and the next section, wherever the words surplus and deficit have been used, they should be taken to mean surplus or deficit in foodgrains availability against demand as calculated on the methodology already explained.

It is heartening to note that, according to the methodology adopted in this study, as many as 180 districts out of a total 281 districts (for which data were available) were surplus in foodgrains and only 101 districts showed food deficit. Separate data were not available for the two clusters of districts of

Kottayam-Ernakulam and Kozhikode-Malappuram-Palghat for which a combined estimate was provided. In the result, data of foodgrains surplus or foodgrains deficit were not available separately for only one district out of total 282 studied.

Map 4 and Table IV.10 depict the spatial distribution of these 180 foodgrains surplus districts. Out of a total of 180 districts, the majority of the districts (102) have only minor foodgrains surplus of less than 100,000 tonnes in a year. Of this group, Madhya Pradesh (28 districts), Uttar Pradesh (22), Karnataka (12) and Rajasthan (10) enjoyed low levels of foodgrains surplus as these states cannot boast of really high ranges of agricultural productivity.

TABLE IV.10
Spatial Distribution of Food Surplus Districts (1971)

Food Surplus Category (in tonnes)	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Jammu & Kashmir	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
600,001 and above	-	-	-	-	2	-	-	-	-	-	-	4	-	1	-	-	7
400,001-600,000	1	-	-	-	1	-	-	-	-	-	-	3	1	-	-	-	6
200,001-400,000	-	-	1	-	2	-	-	-	2	-	2	2	4	1	5	4	23
100,001-200,000	1	-	-	1	2	1	4	-	10	-	1	2	6	1	11	2	42
100,000 and below	3	2	3	4	-	1	12	-	28	3	6	-	10	3	22	5	102
TOTAL	5	2	4	5	7	2	16	-	40	3	9	11	21	6	38	11	180

Note: Due to lack of disaggregated data in the Bhalla-Alagh Study, the estimate of food surplus/deficit for the districts of Kottayam and Ernakulam (in Kerala) was calculated after amalgamating these districts with Kozhikode, Malappuram and Palghat group of districts (all in Kerala).

Nonetheless, it is heartening to find that as many as 40 surplus districts appear in Madhya Pradesh out of a total of 43, as many as 38 surplus districts do emerge in Uttar Pradesh out of a total of 48, 21 surplus districts occur in Rajasthan out of a total of 26, 16 surplus districts occur in Karnataka out of a total of 19, and 4 surplus districts appear in Bihar out of a total of 15. Foodgrains surpluses occurred in 11 districts of Punjab, 7 districts of Haryana, 6 districts of Tamil Nadu, 5 districts each of Andhra Pradesh and Gujarat, 4 districts of Bihar, 3 districts of Maharashtra and 2 districts each of Assam and Jammu & Kashmir. Most of these states, especially Uttar Pradesh and Bihar, have frequently suffered from acute food shortages in the recent past, and, in this respect, this

picture is reassuring.

Out of a total of 180 surplus districts, only 13 districts show food surpluses of substantial amounts of over 400,000 tonnes, and most of them belong to Punjab (7) and Haryana (3). The rest are in Andhra Pradesh and Tamil Nadu. Medium surpluses of 100,000 to 400,000 tonnes appear in 67 districts, mostly located in Uttar Pradesh (16), Madhya Pradesh (12) and Rajasthan (10). The fact that 21 districts of Rajasthan (out of a total of 26), 38 districts of Uttar Pradesh (out of a total of 48), 4 districts of Bihar (out of a total of 15), 16 districts of Karnataka (out of a total of 19), 5 districts of Gujarat (out of a total of 18), and 40 districts of Madhya Pradesh (out of a total of 43) have showed low to moderate food surpluses in recent years (in the 1970's), is itself

a hopeful sign. On the other hand, none of the districts of Maharashtra (out of a total of 26) show a food surplus above 100,000 tonnes. None of the districts of Kerala (out of a total of 7) show any food surplus. These states are in chronic need of food supplies from outside. The situation in Andhra Pradesh (5 surplus districts out of a total of 17) and in Tamil Nadu (6 surplus districts out of a total of 11) could have been better than it was around 1971.

B. Spatial Distribution of Districts Rated Deficit in Foodgrains

Map 5 and Table IV.11 depict the spatial distribu-

tion of 101 food deficit districts of India. Out of the total of 101 districts, only 15 districts are subject to acute foodgrains shortages of over 200,000 tonnes per year. Deficits of over 400,000 tonnes per year occur in one district each of Kerala, Maharashtra and West Bengal and deficits of 300,000 to 400,000 tonnes per year occur in one district each of Andhra Pradesh, Bihar and Maharashtra. Deficits of 200,000 to 300,000 tonnes per year occur in 3 districts of Bihar, 1 district of Gujarat, 3 districts of Kerala, 1 district of Tamil Nadu and 1 district of West Bengal. The heavy foodgrains deficit districts generally have large urban populations.

TABLE IV.11
Spatial Distribution of Food Deficit Districts (1971)

Food Deficit Category (in tonnes)	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Jammu & Kashmir	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
400,001 and above	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	1	3
300,001-400,000	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	3
200,001-300,000	-	-	3	1	-	-	-	3	-	-	-	-	-	1	-	1	9
100,001-200,000	1	-	1	2	-	-	1	2	-	12	-	-	-	-	2	-	21
100,000 and below	10	5	6	10	-	-	2	-	3	9	2	-	5	4	8	1	65
TOTAL	12	5	11	13	-	-	3	6	3	23	2	-	5	5	10	3	101

Note: Please see note below Table IV.10

Foodgrains deficits of amounts ranging between 100,000 to 200,000 tonnes (medium shortages) occur in 21 districts, 12 of which occur in Maharashtra alone. Maharashtra is followed by 2 districts each of Gujarat, Kerala and Uttar Pradesh and 1 district each of Andhra Pradesh, Bihar and Karnataka.

Low but substantial amounts of foodgrains deficit (below 100,000 tonnes per year) occur in as many as 65 districts out of a total of 101 foodgrains shortage districts. Of these, 9 again lie in Maharashtra, 10 each in Gujarat and Andhra Pradesh, 8 in Uttar

Pradesh, 6 in Bihar, 5 each in Assam and Rajasthan, and a few districts in Tamil Nadu (4), West Bengal (1) and Karnataka (2). These districts and states need the urgent attention of agricultural planners and more investments in agricultural inputs like fertilizers and irrigation.

Our estimate of foodgrains surplus or deficit might have been worse than what is here presented, had we based our calculation on the relatively indifferent agricultural years than on 1970-73, which were relatively better crop years.

Estimation of Population Suffering from Lack of Adequacy of Food by Five Age Sex Biological Groups, All-India, 1971*

It would obviously be as wrong to imagine that the entire population in districts enjoying surplus in food-grains production in 1971 was consuming adequate food as to imagine that all of the population of districts facing deficits in foodgrains production in 1971 was suffering from lack of it. There is hardly any quantitative information on exactly how much population in each category of the age-sex biological groups of our study might be consuming adequate food or suffering from lack of it. Similarly, it is in a way begging the question to equate estimates of population below the poverty line with that actually malnourished. The only reasonable conclusion that can be hazarded is that the overall proportion of malnourished may be close to the proportion below the poverty line.

The problem is one of finding an acceptable proxy for the proportion of population that one can assume as deprived of adequate food, or more specifically cereals and pulses. There is no systematic record of districtwise consumption of cereals and pulses according to age sex occupational or biological groups, either for the past or the present and the several excellent regional surveys in recent years yield results of small sample investigations, either by income or range of expenditure on a daily or monthly basis¹. As has already been mentioned, the consumption expenditure surveys of the National Sample Survey (NSS) do not throw much light on possible districtwise variation or norms. Under the circumstances, it is only possible to provide a rough estimate of the population going hungry at the all-India level, classified at five age sex biological groups (see Table V.1).

¹Of the numerous regional surveys on the subject, particular mention may be made of the *Survey of Food Habits in Madras* by the Superintendent of Census Operations, Madras, following the census of 1961; the *Tamil Nadu Nutrition Study* in six volumes USAID: Sidney M. Centor Associates, Pennsylvania, 1973; USAID: *A Study of Food Habits in Calcutta*, New Delhi 1972; National Nutrition Monitoring Bureau's (a) *Report for the Year 1976*, (b) *Section II—Food and Nutrition Consumption Pattern in the Selected Districts of Different States*, 1976.

*V. S. Gahlaut, Research Officer, and Karunamoy Subudhi, Research Associate, assisted in the preparation of Appendix II (Districtwise data of Population in five age and sex biological groups).

There has been much work on the all-India and state levels of concentration curves and distribution of consumption and income. Working on these exercises, P. V. Sukhatme estimated in 1965² that at least 40 per cent of the population in India was going without food adequate to be able to sustain a healthy active life and still another 26 per cent would be malnourished. B. S. Minhas³ has published estimates which put 57 per cent of India's population below the poverty line, the poverty line being defined as per capita monthly consumption less than Rs.20 at 1960–61 prices as adumbrated by the late Pitamber Pant in his *Perspectives of Planning* (1964).

An excellent survey of the literature on measurement of the level of poverty in India is available in a recent World Bank Staff Working paper in which Montek S. Ahluwalia begins by discussing the problems of data and methodology and, particularly, the reliability of NSS data. He begins by reviewing the work of P. K. Bardhan, V. M. Dandekar and Rath, B. S. Minhas, A. K. Sen, P. V. Sukhatme and A. Vaidyanathan⁴. He then proceeds to place together the various NSS based estimates of rural poverty in India (beginning with 1956–57 continuously every year to 1968–69, except for the omission of

²P. V. Sukhatme; *Feeding India's Growing Million*, Oxford, 1965, pp. 1–2.

³B. S. Minhas: *Planning and the Poor*, New Delhi, 1974, pp. 65–101.

⁴Ahluwalia, Montek S., *Rural Poverty in India, 1956/57 to 1973/74*; *India: Occasional Papers*, World Bank Staff Working Paper No. 279, May 1978, pp. 1–42. The following texts are relevant. Bardhan, P. K. (1971) "On the Incidence of Rural Poverty in the Sixties" *Economic and Political Weekly*, February 1973; Bardhan, P. K. and Srinivasan, T. N. (eds) (1974); *Poverty and Income Distribution in India*, Calcutta, 1974; Dandekar, V. M. and Rath, N. (1971); *Poverty in India: Dimensions and Trends*, New Delhi, 1971; Minhas, B. S. (1970) "Rural Poverty, Land Distribution and Development Strategy: Facts" reprinted in Bardhan and Srinivasan (eds) (1974); Rajaraman, I. (1975) "Poverty, Inequality and Economic Growth: Rural Punjab, 1960/61–1970/71", *Journal of Development Studies*, July 1975; Sen, A. K. (1973) "Poverty, Inequality, Unemployment: Some Conceptual Issues in Measurement", *Economic and Political Weekly*, August 1973; Sukhatme, P. V. (1977): *Malnutrition and Poverty*, Ninth Lal Bahadur Shastri Memorial Lecture, June 1977; Vaidyanathan A. (1974) "Some Aspect of Inequalities in Living Standards in Rural India" reprinted in Bardhan and Srinivasan (eds).

the year 1962–63, and for 1970–71 and 1973–74) and compares them with computations for India as a whole and severally for 14 states of the Poverty Index as defined by A. K. Sen. In the next place, he works out the percentage of rural population in poverty for each of 14 states and for India. Two states, Andhra Pradesh and Tamil Nadu, show a distinct trend towards reduction in the percentage of rural population in poverty over the period 1957/58 to 1973/74 from 53.5 to 39.8 and from 67.8 to 48.3 respectively, while all other states show fluctuations in the percentages from year to year. In all, he considers twelve time series estimates, the largest yet in this kind of study.

The percentages of rural population in poverty for India as a whole and the computed Sen's Index, as worked out by Ahluwalia, are as follows:

NSS Based Estimates of Rural Poverty in India

Year	Percentage of Rural Population in Poverty based on State specific Poverty line	Sen's Poverty Index (this index ranges from 0 to 1)
1957–58	53.4	.220
1959–60	48.7	.168
1960–61	42.0	.143
1961–62	42.3	.136
1963–64	49.1	.159
1964–65	50.4	.174
1965–66	51.1	.214
1966–67	57.4	.242
1967–68	57.9	.237
1968–69	53.5	.201
1970–71	49.1	.176
1973–74	47.6	N.A.

Source: Montek S. Ahluwalia: *Rural Poverty in India, 1956/57 to 1973/74* (see footnote 4). See also Table 2, p. 15, Table 3(a), p. 17 and 3(b), p. 18 of the World Bank Paper for details of 14 states for each of the years mentioned above.

According to M.S. Ahluwalia, the percentages in Punjab and Haryana were 28.0 for 1957–58, gradually declining to 18.8 in 1960–61 with a general tendency to rise gradually to 33.9 in 1967–78, and descending thereafter rapidly to 24.0 in 1968–69 and down to 23.0 in 1973–74. These are against the findings of Bardhan, for example, who in 1971, despite the visible success of the Green Revolution, found that the incidence of poverty in Punjab and Haryana increased between 1960–61 and 1967–68; or of Rajaraman (1975) who reported that the incidence of poverty in Punjab (excluding Haryana) increased between 1960–1961 and 1970–71. Ahluwalia is of the opinion that since the year 1960–61 had an unusually low value, that year should not have been made

the base year for comparison and that the "consideration of the time series as a whole clearly does not suggest a trend increase in the incidence of poverty". Ahluwalia then proceeds to conclude that the "incidence of poverty in rural India does not show any substantial trend over the past two decades. What we observe in most of rural India is a pattern of fluctuation with an increase in the incidence of poverty in one sub-period followed by a decrease in another."

The above figures are for rural populations of the states and of India. The figures for the overall populations (rural and urban) are difficult to assess for lack of data to compute with the assurance possible in the case of rural populations. It is difficult to assess whether the urban percentages will be lower or higher for India as a whole, having regard to the wide variations in conditions in class sizes of cities and towns according to their geographical locations although Ahluwalia's Table 5 suggests that the percentages of urban population in poverty will be lower. Sukhatme's figure of 40 was for the mid-sixties for which Ahluwalia's corresponding figures for rural poverty are 50.4 for 1964–65 and 51.1 for 1965–66. This latter figure for 1970–71 decreased slightly in Ahluwalia's exercise to 49.1. The corresponding Sen's poverty indexes are .174 for 1964–65, .214 for 1965–66 and .176 for 1970–71. In view of this, it was decided to adopt the most conservative figure for the proportion of population estimated as going hungry in India in 1971. With this end in view, we have passed by the higher percentages that are more recent and close to the year 1971 and adopted Sukhatme's 1965 estimate of 40 per cent, not only out of a desire to be on the conservative side and avoid accusations of being alarmists, but also to keep in step with Dandekar and Rath's assumptions in their *Poverty in India*. It is important to note here that P.V. Sukhatme has since refined his calculations still further and arrived at a much lower figure than 40 per cent.

Table V.1 gives an estimate of the total population and the deprived population at the all-India level classified according to the five age sex biological groups. Adopting the all-India proportion of 40 per cent of population suffering from inadequacy of food, i.e., cereals and pulses, we have applied the same ratio uniformly for each of the five age sex biological groups. The result shows that in 1971 about 211 million people out of the total 523 million population (of selected 282 districts) were in danger of facing or actually facing shortage of food.

We have also attempted to find an acceptable proxy for the proportion of population at the district level which can be assumed to be deprived of adequate food, for instance, by considering the Gini concentra-

TABLE V.1
Estimated Population Suffering from Inadequacy of Cereals and
Pulses in 1971 Classified by Selected Age Sex Biological Groups,
All-India

	Total population	Population suffering from lack of adequacy of foodgrains for consumption
ALL-INDIA		
Total Population	523,553,005	211,211,649
1. Adult Males	157,249,120	63,237,014
2. Adult Females	145,975,677	59,183,385
a) Pregnant	6,130,961	2,485,695
b) Lactating	8,904,648	3,610,183
c) Others	130,940,068	53,087,507
3. Children 0-14	220,328,198	88,971,250
Proportion of deprived population to total at the all-India level 40%		

tion ratio of land inequality at the district level as a yardstick and finding an equivalent measure of population going hungry at that level. But such attempts were later found to be bedevilled with some

conceptual and methodological difficulties, and, so, such estimates of deprived population computed at the district level were omitted from the present report.

We undertook this kind of exercise in the hope that the unsatisfactoriness of the data base will stimulate the collection of the right type of data in this field of great importance at the right level of disaggregation, which is obviously the district, if not even smaller area units. For, if area planning at the district or even lower levels were to have any meaning, it should be of importance to monitor cereals and pulses intake by age-sex occupational and biological groups and to strike a balance between total consumption and total production by defined areas as a measure of the terms of trade between micro-regions. It is hard to overestimate the need for organising investigations for norms of cereals and pulses intake for identified and disaggregated small areas and populations all over the country. More refined methodologies than are within the competence of the present authors will have to be evolved with the help of more precise data of consumption by each group of population.

Future Implications

1. Future Food Demands and Supplies

The demand projections presented in chapter 10 of Part III—Demand and Supply of the *Report of the National Commission on Agriculture* (1976) steer clear of the short term dislocations that occurred in the planning and investment processes during 1974-77. The projections of population growth and of demand for food crops up to 2000 adumbrated in that chapter have been adopted as the basis of this discussion.

In considering the demand projection, one should bear in mind the reservations set out in the exercise itself. Demand would be influenced by changes in the spatial and rural-urban distribution of population as also its age-sex structure and by interregional and intersectoral differences in tastes and preferences. There are also problems with regard to—(a) break-up of the base level demand by sectors and regions; (b) assumptions about sectoral and regional rates of growth of population and per capita incomes; and (c) estimated values of sectoral and regional demand co-efficients¹. The Agricultural Commission exercise treats the period up to and beyond 1985 as two distinct periods out of regard for these considerations. The demand projections were derived at constant prices, with the use of alternative functional forms for different commodities. Demand elasticities, based on cross-section family budget data for the different commodities for which projections were to be presented, were derived separately for the rural and urban sectors, by fitting the alternative functional forms to the data on consumer expenditure based on the National Sample Survey (NSS) for the year 1970-71. As for trends in the growth of population, the Commission adopted the Medium-2 level of projections presented in a study sponsored by the Indian Association for the Study of Population². The exercise assumed an overall long term rate of economic growth of 5 per cent during 1971/72 to 2000/01. The total GDP was projected to increase from Rs. 391,790 million in 1971-72 to Rs. 1,664,000 million in 2000/01 at 1971/72 prices. The estimates of private consumption expenditure (PCE)

in 2000/01 were based on the following assumptions: (i) public consumption expenditure after Seventh Five Year Plan (at that time after 1989) would be considerably stepped up; and (ii) the rate of capital formation in the private and the public sectors would rise sharply for financing investments. It was also assumed that the indirect taxation in proportion to GDP at market prices would remain constant. The total PCE was estimated at Rs. 997,710 million in 2000/01 implying a compound rate of growth of 3.9 per cent per annum during 1971/72 to 2000/01. Allowing for the expected increase in population, the rate of growth in per capita PCE worked out to 2.0 per cent per annum during this period. Shortage of space will not permit going into other details of methodology.

The per capita demand for foodgrains was assessed at 171.25 kg. in 1971, between 176.24 kg. (low) and 190.99 kg. (high) in 1985 and between 179.92 kg. (low) and 194.68 kg. (high) in 2000.

The projected population of India accepted for this exercise gave the following figures:

Assumption	Population (million) in year						
	1971	1976	1981	1986	1991	1996	2001
Medium ²	547.0	605.6	668.2	734.0	801.2	872.6	945.4

The aggregate consumer demand for foodgrains alone was projected as follows:

	1971	1985		2000	
		Low	High	Low	High
Foodgrains (in million tonnes)	94.31	127.76	138.45	168.29	182.10

The exercise observed that "assuming that the gross output of foodgrains in 2000 would meet the expected demand in that year, the total requirements for seed, feed and wastage would work out to 19.0 per cent of the gross output on the high assumption of growth per capita PCE. It is further assumed that the current rate of allowance for these purposes at 12.5 per cent would increase to 13.7 and 15.0 per

¹ Report of the National Commission on Agriculture, 1976; Part III. Demand and Supply, Chapter 10, p.5.

² S. Raghavachari; Population Projections, 1976-2001 in *Population in India's Development, 1947-2000*; 1974, p. 437.

cent in 1980 and 1985 to reach a level of 19.0 per cent in 2000." It was assumed that nearly 5 million tonnes of foodgrains would be utilized for industrial purposes by 2000. The total requirements of foodgrains for seed, feed, wastage and industrial uses was estimated at between 22.5 and 24.4 million tonnes in 1985 and between 37 and 43 million tonnes in 2000.³

Inclusive of these allowances the aggregate gross demand for foodgrains was assessed at:

	1971		1985		2000	
			Low	High	Low	High
Foodgrains (in million tonnes) 107.9			130.3	162.9	205.3	225.1

The effort needed to fulfil aggregate demands of this order along the indicated time-path has been considered by numerous individuals and research institutions. For the purpose of this brief review, however, projections worked out by the National Commission on Agriculture, 1976, are presented below:

The Commission estimated that the gross irrigated area in 2000 would be of the order of 84 MHA, comprising 51 MHA of surface irrigation and 33 MHA of groundwater irrigation. With the increase in the gross irrigated area, the multiple cropped area in 2000 might go up to 55 MHA and the gross cropped area to 204 MHA which would imply a cropping intensity of 1.39.⁴ The gross cropped area in 2000 was estimated at 200 MHA on the basis of a study of the rainfall and cropping regions. The Commission assumed that the cropping intensity would be 1.38 in irrigated area and 1.30 in the rainfed areas or areas with one irrigated crop. The estimates for 1985 were interpolated on the basis of past trends. On these considerations, the estimates of multiple cropped area, gross cropped area and irrigated area in 1985 and 2000 worked out as follows:

³Report of the National Commission on Agriculture: Part III; Chapter 10, p.21.

⁴Report of the National Commission on Agriculture, 1976: Part III. Demand and Supply, Chapter 11, pp.60-61. The function fitted was $\log A_n = a + b (\log A_i)$ where A_n = multiple cropped area and A_i = gross irrigated area.

⁵Report of the National Commission on Agriculture: Part III. Demand and Supply; Chapter 11; Table 11.4, p.61.

⁶Op.cit. Chapter 11, Table 11.12; p.79.

Estimates of Net Sown Area, Area Sown more than once, Gross Cropped Area and Net and Gross Irrigated Area⁵

	1970-71	1985	2000 (MHA)
Net sown area	140.4	145.0	150.0
Area sown more than once	24.7	36.0	50.0
Gross cropped area	165.1	181.0	200.0
Intensity of cropping (3 upon 1)	1.18	1.25	1.33
Net irrigated area	31.2	46.0	61.0
Area irrigated more than once	7.3	15.0	23.0
Gross irrigated area	38.5	61.0	84.0
Intensity of cropping in irrigated land (7 upon 5)	1.23	1.33	1.38

The National Commission on Agriculture took into account the possibilities of accelerated response from irrigation, improved seeds, plant protection, nature and intensity of use of power in agriculture, better agricultural implements and post-harvest technology, better agronomic practices and improvement in the quality of management, and arrived at the view that "taking all relevant factors into consideration, the yardstick of 10 kg. of additional production of foodgrains per kg. of nutrients would reasonably represent the average performance of both high yielding and traditional varieties of cereals and pulses under actual field conditions. It might be possible to improve the average fertilizer response rate to 1:12.5 by the turn of the century through technological and varietal research on crops." The estimates of additional production of foodgrains in 1984-85 and 2000 as given by the Commission are as follows:

Additional Production of Foodgrains, 1985 and 2000		
Programme	Additional production of foodgrains expected over the base period	
	1985	2000
Irrigation	7.5	10.4
Command area development	2.1	6.6
Dry farming programme	1.4	7.0
Fertilizers	A. 28.0 B. 35.0 C. 49.0	102.0
	A. 39.0 B. 46.0 C. 60.0	126.0

A = on the assumption of total consumption of fertilizers of 6.0 million tonnes on the basis of past trends

B = on the assumption of total consumption of fertilizers of 7.0 million tonnes

C = on the assumption of total consumption of fertilizers of 8.8 million tonnes⁶

The Commission made the following comments:

Fertilizers alone are expected to contribute between three-fourths and four-fifths of the additional production of foodgrains in 1985. It will be seen that with the consumption level of 6.0 million tonnes in 1985, the likely production of foodgrains would be 143 million tonnes.* However, on the basis of the low income growth assumption, the demand for foodgrains is estimated at 150 million tonnes. The consumption of fertilizers would need to be stepped up to 7 million tonnes to achieve this level of foodgrains production. This would mean an increase in the level of fertilizer consumption in 1985 over 1971 of about 4.7 million tonnes. For achieving this level, tremendous efforts would be needed by way of organising an effective distribution machinery and instituting an infrastructure which would extend necessary credit and extension support to cultivators to enable them to absorb the additional quantities of fertilizers especially in certain regions of the country like Eastern and Central India where the present consumption levels are very low. Thus the critical factor would be response of the farmers to be stimulated by extension and appropriate land policy. It may not be out of place to mention here that with the evolution of location-specific high yielding varieties of paddy, fertiliser consumption would get a boost.

The demand for foodgrains on the assumption of high income growth has been estimated at 163 million tonnes in 1985 in the preceding chapter. In case the demand for foodgrains of this order materialises, it would be necessary to increase foodgrains production to about that level. It will be seen from Table 11.12 that consumption of fertilisers would have to be pushed up to about 9 million tonnes. It is recognised that it would be difficult to reach a production of 164 million tonnes unless fertiliser consumption is increased to that level. Naturally, this increased level of fertiliser consumption would require tremendous efforts already outlined.

2. Correlation Analysis of Interrelationships between Agricultural Productivity, Growth Rates and Agricultural Inputs

The districtwise statistical analysis, based on the variables of the Bhalla-Alagh Study, 1962/65 to

*For an output of 150.3 million tonnes of foodgrains in 1985, on the basis of nutrient removal method a consumption of 6 million tonnes of fertilizers would be adequate.

1970/73 and on the population of 1971, however, indicates that the timepath of production outlined above will be far from smooth and easy. It will demand a great deal of change in the agrarian and technological systems, determined efforts at income distribution along with efforts equitably to distribute inputs, technology, agronomic knowledge, institutional credit and extension facilities, along with improvements in marketing. Above all, there will have to be much greater acceleration in employment and wages at the lower deciles of consumption to augment aggregate demand, which periodically threatens to sag for lack of purchasing power and thereby reduce the urge of peasants and farmers to produce more.

This section is devoted to the study of a simple correlation analysis matrix of ten variables. Out of the total of 282 districts initially selected, complete data or estimates on 9 selected variables were available for 277 districts. Estimates or basic data for one or the other variable(s) were not available for 4 districts (Greater Bombay, Shahabad, Bhandara and Baudh-Khondmals). The two separate groups of districts, Ernakulam-Kottayam and Kozhikode-Malappuram-Palghat, were treated as one district since information was available only for the five districts as a group. This reduced our analysis from 282 districts to 277.

The 9 selected variables for each district considered are listed as follows:

1. Total population of the district (1971);
2. Agricultural growth rate (1962/65 to 1970/73);
3. Agricultural productivity in rupees per hectare (1970/73);
4. Total foodgrains production (average of 1970/73 production);
5. Food surplus in the district in tonnes (1971);
6. Food deficit in the district in tonnes (1971);
7. Gini concentration ratio of land ownership pattern in the district (1971);
8. Average NPK fertilizers used in tonnes (1970/73);
9. Area irrigated (average of 1970/73 period).

A simple correlation matrix between the variables was first undertaken. This is presented in Table VI.1

Of the statistically significant results may be mentioned the following (the actual co-efficients are mentioned within brackets).

The total population of a district bears quite significant and positive relationship with (a) total food production (0.58); (b) NPK fertilizer used (.51); (c) area irrigated (.42); and (d) agricultural

R. N. Bose, Research Officer, did the computer programming for the analysis.

TABLE VI.1
Simple Correlation Matrix (District Level Data)

Serial No.	Variables	Total population (1971)	Agricultural growth rate (1962/65 to 1970-73)	Agricultural productivity level per hectare, 1970s	Total food production (Av. of 1970-73)	Food surplus (1971)	Food deficit (1971)	Gini concentration ratio of land ownership (1971)	Average NPK fertilizers (1970-73)	Area irrigated (1970-73)
		1	2	3	4	5	6	7	8	9
1	Total population	1.0	-.1043	.3155**	.5767**	-.0713	.5877**	.1446*	.5117**	.4226**
2	Agricultural growth rate		1.0	.3871**	.3919**	.5149**	-.3382**	.0516	.1866*	.3282**
3	Agricultural productivity per hectare			1.0	.4765**	.3245**	.0244	.0740	.5468**	.4598**
4	Total food production				1.0	.7140**	-.0511	.0805	.6725**	.8107**
5	Food surplus					1.0	-.2507**	-.0405	.4161**	.6235**
6	Food deficit						1.0	.0401	.1013	-.0689
7	Gini concentration ratio of land ownership							1.0	.0083	.0440
8	Average NPK fertilizers								1.0	.7799**
9	Area irrigated (in hectares)									1.0

*Significant at 5% level.

**Significant at 1% level.

productivity per hectare (.32). More people implies more food production, more investments in fertilizers and irrigation, and increase in productivity. In short, concentration of human labour is still as vital a factor in agricultural production as any other input. Low but positive correlation occurs between population and land inequality, i.e., Gini co-efficient (0.14). This suggested that more population pressure leads to increased concentration of land ownership in fewer hands. These findings support our common beliefs. Positive and highly significant relationship also emerges between the amount of food deficit in a district and the total population of that district (.59). This means that as the population pressure increases food deficit also increases.

The second variable, agricultural growth rate, bears quite significant and positive relationship to the amount of food surplus in a district (.51). The higher the agricultural growth rate, the higher the amount of food surplus and the lower the amount of food deficit (-.34). Agricultural growth rates also show significant and positive, but not very strong, association with productivity per hectare (.39) and total food production (.39). Curiously enough, such input variables as amount of area irrigated (.33) and fertilizers (.19) do not come out as strongly related with agricultural growth rate as might be expected. This underlines the fact that in recent years a higher

agricultural growth rate has been occurring in those districts which had a low production base to start with and where not much investment in irrigation or fertilizers has yet gone to stimulate rise in growth rates. This was later confirmed in the more detailed regression analyses.

But significantly enough, and contrary to the findings of the last paragraph, the third variable, agricultural productivity per hectare shows stronger positive correlation with (a) NPK fertilizers (.55) and (b) the amount of area irrigated (.46). The associations with total food production (.48) and food surplus (.32) are, as one would expect, significant and positive. Then again, the fourth variable, total food production is highly and positively associated with irrigation (.81) and NPK fertilizers (.67) and, naturally enough, with food surplus (.71) on the one hand. On the other hand, one can legitimately conclude that the use of agricultural inputs and investments on fertilizers and irrigation are still limited to areas which started with a higher productivity base, but that these inputs, investments and growth efforts are not overwhelmingly responsible for increasing the agricultural growth rates except where the synergism has struck. The reason for increase in growth rates seems to lie elsewhere, exogenous to investment efforts (perhaps, human effort, favourable rainfall, increase in cropped area,

multiple cropping or other factors connected with human effort and natural endowments).

The fifth variable, food surplus is more highly and positively associated with agricultural growth rates (.51) than with agricultural productivity per hectare (.32). It is, as is to be expected, strongly and positively associated with irrigation (.62) and NPK fertilizer use (.42). On the other hand, the sixth variable, food deficit shows no significant relationship, either positive or negative, with NPK fertilizers or area irrigated.

The above findings have a certain policy significance. We shall have to emphasize more on pushing up the agricultural growth rates of districts to still higher levels, especially that of low growth rate districts (through human effort, multiple cropping, intensive cultivation and, of course, with small and minor irrigation techniques) than simply concentrating attention and investment on the highly productive districts, which have already managed to usurp

much of the national growth effort and investment but contribute, owing to the high population pressure upon them, comparatively less to the nation's total reserve of food surplus. The same observation applies generally to food deficit districts. Food deficit occurs less in those districts which have recently speeded up their agricultural growth rates (-.34) than in those districts which have merely enhanced productivity per hectare (.02) through increased use of fertilizers and irrigation. These findings were borne out by subsequent regression analyses.

No worthwhile relationship was discernible between the seventh variable, the Gini concentration ratio (land inequality) and any of the other eight variables considered except population pressure (.14). The reasons for this weak relationship have been anticipated in Chapter IV, Section 3.

Lastly, the eighth variable, NPK fertilizers is very highly and positively associated with the ninth

TABLE VI.2
(a) Multivariate Regression Analysis

Sl. No.	Dependent variable	Independent variables	R ² (Multiple correlation co-efficient square)	Beta co-efficient	Intercept	N (No. of observations)
1.	Agricultural growth rate (X ₂)	(i) Average NPK fertilizers (X ₈) (ii) Area irrigated (X ₉)	0.1200**	-0.00006 0.00001**	0.8303	277
2.	Total food production (X ₄)	(i) Gini coefficient of land ownership (X ₇) (ii) Average NPK fertilizers (X ₈) (iii) Area irrigated (X ₉)	0.6636**	16.3020 2.4939 1.0841**	77630.58	277

(b) Stepwise Regression Analysis

Sl. No.	Dependent variable	Independent variables	Individual contribution	Cumulative contribution	Beta co-efficient	Intercept	N (No. of observations)
3.	Total food production (X ₄)	(i) Area irrigated (X ₉) (ii) Average NPK fertilizers (X ₈) (iii) Gini Coefficient of land ownership (X ₇)	0.6572** 0.0041 0.0023	0.6572 0.6613 0.6636	1.0841** 2.4939 16.3019	66871.89	277
4.	Agricultural productivity per hectare (X ₃)	(i) Average NPK fertilizer (X ₈) (ii) Area irrigated (X ₉) (iii) Gini Coefficient of land ownership (X ₇)	0.2990** 0.0048 0.0024	0.2990 0.3038 0.3062	0.0250** 0.0003 0.0497	20 9.96	277

* Significant at 5% level.

**Significant at 1% level.

- The variables (1) area irrigated and (2) fertilizers used explain only 1 per cent of total variation in the agricultural growth rate.
- The variables (1) fertilizers used, (2) area irrigated and (3) Gini coefficient together explain around 66 per cent variation in the total food production.
- On further analysis, through stepwise regression, the variable, area irrigated, alone explains 65 per cent of variation in the total food production, while the contribution of fertilizers or land inequality is almost insignificant.
- The variable, fertilizer used, alone explains 29.9 per cent variation in agricultural productivity per hectare, the contributions of irrigation or Gini coefficient falling almost to zero.

variable, area irrigated (.78). This indicates that in India these two primary agricultural inputs have highly skewed and concentrated distribution. That is, it is those districts that enjoy high irrigation facilities that also get the privilege of higher inputs of fertilizers. Conversely, it is those districts that are denied one facility that are also denied the other. Such a situation, although it may have increased the total food production of the country, nevertheless, leaves much to be desired for an equitable distribution of agricultural inputs and shows the amount of leeway that remains to be made up before the country can set itself firmly on the timepath suggested by the National Commission on Agriculture.

3. Regression Analysis Results

Following the exploratory correlation matrix exercise, a series of bivariate regression analyses

(numbering 11), multiple regression analyses (numbering 6) and stepwise regression analyses (numbering 6) were undertaken. Out of the series of 23 regression analyses, only 13 yielded statistically more or less significant results.

The multivariate regression analysis of dependent variables (i) agricultural growth rate and (ii) total food production, and independent variables (i) average NPK fertilizer, (ii) area irrigated and (iii) Gini co-efficient of land ownership, yielded statistically significant results.

Separate multivariate regression analyses† of (i) 178 food surplus and (ii) 99 food deficit districts yielded several additional interesting results, important for policy considerations.

Table VI.3 in two parts gives the results of the multivariate regression analysis of food surplus districts.

TABLE VI.3
(a) Multivariate Regression Analysis
Dependent Variable: Food Surplus

Sl. No.	Independent variables	R ² (Multiple correlation co-efficient square)	Beta co-efficient	Intercept	N (Sample size)
1	2	3	4	5	6
1.	Gini co-efficient of concentration of land ownership (X ₁)	0.0073	- 24.6715	271442.48	178
2.	Agricultural growth rate (X ₂)	0.2822**	35565.79**	37261.69	178
3.	(i) Average NPK fertilizers (X ₃)	0.5684**	- 1.4991	23095.73	178
	(ii) Area irrigated (X ₄)		0.8851**		
4.	(i) Total population (X ₁)		- 0.1451**		
	(ii) Agricultural growth rate (X ₂)		15.7621		
	(iii) Productivity per hectare (X ₃)		- 6.0581		
	(iv) Average food production (X ₄)	0.9849**	0.9512**	14891.66	178
	(v) Gini co-efficient (X ₁)		- 1.2684		
	(vi) Average NPK fertilizer (X ₃)		1.1836		
	(vii) Area irrigated (X ₄)		- 0.0059		

(b) Stepwise Regression Analysis
Dependent Variable: Food Surplus

Sl. No.	Independent variables	Individual R ²	Cumulative R ²	Beta co-efficient	Intercept	N (Sample size)
1	2	3	4	5	6	7
5.	(i) Area irrigated (X ₄)	0.5660**	0.5660	0.8851**	20299.92	178
	(ii) Average NPK fertilizers (X ₃)	0.0024	0.5684	- 1.4991		
6.	(i) Total food production (X ₄)	0.6794**	0.6794	0.9494**		
	(ii) Total population (X ₁)	0.3041**	0.9835	- 0.1451**		
	(iii) Average NPK fertilizer (X ₃)	0.0013	0.9848	1.1226	8285.17	178
	(iv) Agricultural productivity per hectare (X ₃)	0.0001	0.9848	- 5.8612		
	(v) Gini co-efficient (X ₁)	0.0000	0.9849	- 1.2644		

*Significant at 5% level.

**Significant at 1% level.

† Out of total 180 food surplus districts information on Gini concentration ratio of land ownership was not available for two districts (Shahabad and Bhandara). Similarly, out of total 101 food deficit districts data were not available for the same variable for two districts (Greater Bombay and Baudh Khondmals). These four districts were excluded from the analyses.

The Table yields the following conclusions:

A. Food Surplus Districts

1. Twentyeight per cent of total variation in the amount of food surplus is accounted for by agricultural growth rate. This means that effort in the coming years must concentrate on the sluggish districts towards higher growth rates, if we wish to raise the country's total food surplus. Productivity per hectare alone has no significant contribution to the raising of food surpluses.

2. The variables, area irrigated and fertilizer used, together explain about 57 per cent of variations in surpluses in districts. But, on further analysis, through stepwise regression, it is found that the variable, area irrigated, is the most important factor

among the two, accounting for as much as 56.6 per cent of food surplus, while fertilizer input accounts for less than .003 per cent. In short, fertilizers have yet to make a nation-wide definitive impact. The immediate policy relevance of the finding is that fertilizer use is still far from being universal or adequate, while irrigation has communicated its message universally. Further, that irrigation is the single most important contributing factor in the creation of food surplus districts and in converting more of human labour into agricultural wealth. Neither fertilizers nor the more sophisticated investments on growth efforts like tractors, irrigation engines, etc., have yet produced a perceptible, all-over effect on increase in per hectare productively levels.

3. When total food production and total population

TABLE VI.4
(A) Multivariate Regression Analysis
Dependent Variable: Food Deficit

Sl. No.	Independent variables	R ² (Multiple correlation co-efficient square)	Beta co-efficient	Intercept	N (Sample size)
1	2	3	4	5	6
1.	Gini co-efficient of concentration of land ownership (X ₁)	0.0119	17.1246	1.63	99
2.	Agricultural growth rate (X ₂)	0.0112	- 3872.96	105581.40	99
3.	(i) Average NPK fertilizers (X ₃)	0.0782	5.3032**	91352.07	99
	(ii) Area irrigated (X ₄)		- 0.2840*		
4.	(i) Total population (X ₁)		0.1525**		
	(ii) Agricultural growth rate (X ₂)		- 175.64		
	(iii) Agricultural productivity per hectare (X ₃)		1.1628		
	(iv) Total food production (X ₄)	0.9994**	- 1.0124**	- 3470.46	99
	(v) Gini co-efficient (X ₁)		0.3110		
	(vi) Average NPK fertilizer (X ₃)		0.1959**		
	(vii) Area irrigated (X ₄)		0.0067		

(B) Stepwise Regression Analysis
Dependent Variable: Food Deficit

Sl. No.	Independent variables	Individual R ²	Cumulative R ²	Beta co-efficient	Intercept	N (Sample size)
1	2	3	4	5	6	7
5.	(i) Average NPK fertilizers (X ₃)	0.0339	0.0339	5.7778**	87758.02	99
	(ii) Area irrigated (X ₄)	0.0443*	0.0782	- 0.3377*		
	(iii) Gini co-efficient (X ₁)	0.0249	0.1031	25.6046		
6.	(i) Total population (X ₁)	0.4144**	0.4144	0.1528**		
	(ii) Total food production (X ₄)	0.5349**	0.9993	- 1.0147**	2738.00	99
	(iii) NPK fertilizer (X ₃)	0.0002*	0.9995	0.2016**		
	(iv) Area irrigated (X ₄)	0.0000	0.9995	0.0078		

*Significant at 5% level.

**Significant at 1% level.

are included and considered in the stepwise regression analysis, the importance of irrigation in enhancing food surplus suddenly goes down and disappears. Instead, total food production of the district alone explains 68 per cent of variation, and total population of the district accounts for another 30 per cent of variation in the reserve of food surplus in the district. By contrast, all other variables, like NPK fertilizers, area irrigated, Gini coefficient, agricultural productivity per hectare and agricultural growth rate, become insignificant. This suggests that the population pressure negatively affects the creation of food surpluses, and the total food production is the main factor in ensuring food surplus. Stepwise regression analysis also makes it evident that total food production, in turn, depends upon area irrigated (explaining 65.7 per cent of food production) while the contribution of fertilizers, as already observed, is still negligible. There are two inescapable policy messages: (1) the sooner unirrigated areas are brought under irrigation the better for food surpluses, even if no other modern inputs are available on a satisfactory scale; (2) fertility control or population planning, including modulation of migration, is essential if the continuity of surpluses is to be maintained.

B. Food Deficit Districts

Similar analysis of 99 food deficit districts of India yielded the following results.

1. The crucial variables that go together to answer for food deficit in the districts are (a) total population of the district (accounting for 41 per cent) and (b) total food production of the district (accounting for another 58 per cent of the variation). Thus, population pressure is still one of the most important reasons for food deficits in the 99 food deficit districts. Irrigation and modern inputs have yet to make any significant mark whatsoever.

2. Food production accounts for 58 per cent of variations in the amount of food deficit, which, in turn, depends upon the area irrigated. So, all things considered, irrigation holds the key to food deficit districts and to enable India to tread firmly on the path of self-reliance.

Our findings are not tautological in the sense that it is not our argument that food deficit occurs due to more population and less food production. Rather, it emphasizes that (a) in food deficit districts very little irrigation, fertilizers and other investments have yet gone in and (b) total population pressure is still the most crucial element in this agriculturally involuted country.

Migration, Urbanization and Agricultural Productivity Levels

As indicated in the Preface, another purpose of this study was to assess the extent to which different levels of agricultural productivity induce higher or lower rates of growth in urbanization, internal migration and employment in the non-agricultural sectors. That is, to assess whether or not high food availability or agricultural productivity (in levels 1, 2, 3) attracts labour migrants from outside the district or generates employment in the non-agricultural and agricultural sectors. This analysis was limited to the six productivity levels.

Table VII.1 presents the summary of data in a tabular form. The first column indicates agricultural productivity levels (1970's) arranged in decreasing order; the second column shows growth rates of total population during 1961-71 decade; the third and the fourth columns present respectively growth rates of rural and urban population during the same decade; the fifth column refers to growth rates of total immigrants into the districts during 1961-71; the sixth column depicts growth rates of the non-agricultural workers, 1961-71; the seventh and the eighth columns indicate growth rates of male cultivators and

male agricultural labourers respectively during 1961-71 decade.

Population growth rates vary from a minimum of 22.0 per cent in level 4 to a maximum of 27.4 per cent in level 3, but both the levels 3 and 4 belong to medium productivity. In other words, the highest and lowest population growth rates are found almost in the same category of agricultural productivity level. No significant relationship appears between the two. Recalling that all-India population growth rates during the same decade (1961-71) was 24.9 per cent, the population growth rates in different agricultural productivity levels appear to lie a few percentage points above or below that mean figure; but no statistically significant conclusion can be drawn from their variations.

Almost similar observations emerge when we attempt to correlate growth rates of rural population or urban population during 1961-71 with the six agricultural productivity levels. The all-India average growth rate of rural population is approximately 21 per cent during the decade 1961-71. Growth rates, both below and above this mean,

TABLE VII.1
Growth Rates of Population Characteristics Cross-Classified By Agricultural Productivity Levels, India, 1961-1971

Agricultural Productivity Level (Rs. per hectare)	Growth Rates of Population 1961-71	Growth Rates of Rural Population, 1961-71	Growth Rates of Urban Population, 1961-71	Growth Rates of Immigrants, 1961-71	Growth Rates of Non-Agricultural Workers, 1961-71	Growth Rates of Cultivators, Male, 1961-71	Growth Rates of Agricultural Labourers, Male, 1961-71
1	2	3	4	5	6	7	8
I Rs. 1600 and above	23.78	20.69	36.97	- 0.47	- 10.46	2.30	91.65
II Rs. 1400-1600	24.68	21.07	35.07	- 17.31	1.41	1.69	94.62
III Rs. 1200-1400	27.53	22.11	43.23	14.00	- 1.94	3.20	102.57
IV Rs. 974-1200	21.95	20.04	36.10	19.18	- 15.09	0.17	92.76
V Rs. 600-974	24.59	17.94	41.16	19.24	- 11.65	5.89	79.33
VI Below Rs. 600	27.11	24.50	37.11	24.15	1.23	5.87	46.66
Mean of 279 districts	24.94	21.06	38.27	9.80	- 6.08	2.62	84.60

Note: Sample size is 279 districts. Data for Jind, Ropar and Valsad were not available.

R. N. Bose, Research Officer, prepared all the tables of this Chapter, computer programming for this analysis, and Appendix III.

appear to have occurred in the lowest two agricultural productivity levels (levels 5 and 6). In other words, no concurrence exists between the rural population growth rates and the levels of agricultural productivity. The all-India growth rate of urban population during the same decade was 38.27 per cent. Here again, the urban growth rates in various productivity levels indicate only a few percentage points above or below this all-India mean figure. This, however, comes as no surprise.

Higher urban growth rates (around 41–42 per cent) are observed in the low productivity level (level 5) as well as in the medium productivity level (level 3), and lower urban growth rates (around 35–36 per cent) are registered by both higher productivity level (level 2) and medium productivity level (level 4). No clear-cut relationship between the two emerges. When examined at such aggregated data level, it does not support the usual hypothesis that higher agricultural productivity supports higher urbanization rates, not at least in India. Nor does a hypothesis of inverse relationship between the two holds good. However, no final comment is warranted at this level of aggregative analysis. It calls for more penetrating analysis with the help of disaggregated data at the district level.

The fifth column is appropriately intriguing, viz., the relation of growth rates of immigrants (during 1961–1971) vis-a-vis agricultural productivity levels. Broadly speaking, more migrants are drawn in and are absorbed in the lower order agricultural productivity levels (their absolute magnitude also increases as productivity level decreases) and more migrants are repelled from the higher order agricultural productivity levels. One may be entitled to draw the conclusion that higher levels of mechanisation and investments in agriculture and greater use of labour-saving devices (as tractors and pump sets) in areas of higher agricultural productivity levels (levels 1 and 2) have been discouraging or repelling long term migrants to come to these areas. It has to be remembered that the population census which is deliberately programmed during the slack agricultural season (end of February through the beginning of March) to minimise the effects of movements and to ensure greater accuracy of the *de jure* count does not reflect net seasonal immigrants for sowing, weeding and harvesting. Hence it would be unwise to stress the tentative conclusion just stated, because there is plenty of research evidence to support the opposite view. What one can reasonably argue is that areas of high investment and tractorisation resist long term migrant settlements of rural agricultural labour. Specially noticeable is the net negative growth of migration in level 2. Converse-

ly, the labour-intensive nature of work and old traditional way of cultivating in the lower-order agricultural productivity levels (levels 3, 4, 5, 6) have permitted, rather have encouraged, more immigrants to come and live in these areas. It also seems that higher population pressure, caused by natural increase and new migrants, have led to agricultural involution in these low productivity areas. More workers and their dependents seem to be entering into these zones to be absorbed at still lower levels of per capita productivity and consumption. As a result, productivity remains stubbornly at lower levels and poverty is shared among them.

In short, it appears that agricultural involution under conditions of unlimited supply of labour migrants has been occurring in India at the lower order agricultural productivity districts on the one hand, and on the other, labour displacements and restrictions on the long term migrant labour under increased mechanisation and capital-intensive agriculture have been taking place in higher order productivity levels. Unless this process is arrested and directed towards a planned transformation of the agricultural landscape in India, it might soon lead to steepened polarisation, conflict, violence, increasing social and economic inequality and injustice. What is more, agricultural productivity in the more favoured areas is likely to suffer through fall in demand of the increased produce.

The sixth column indicating the relationship between growth rates of employment generation in the non-agricultural sectors (1961–71) and the agricultural productivity levels is also intriguing. Negative growth occurred in four out of six productivity levels, in level 1 (highest), levels 3 and 4 (medium), and in level 5 (lower). Slightly positive growth rate in non-agricultural employment is noticed only in 2 out of 6 agricultural productivity levels (in level 2 and level 6). Level 2 is second highest productivity category and level 6 is the lowest productivity category. The fact that slight increase in non-agricultural employment occurred in both the second highest and the lowest levels blurs the picture. What is more significant is that higher or medium levels of agricultural productivity have not encouraged (rather discouraged) growth of employment in non-agricultural sectors. It is probable that the money surplus or savings have gone into the agricultural sector itself in order to enhance agricultural productivity. It probably also indicates that more full-time work employment was being generated within the agriculture sector. Negative growth rate in non-agricultural employment suggests that some labour displacements are occurring from non-agricultural to agricultural sectors. This

seems to be borne out by the fact of an inordinate increase in the number of landless agricultural labourers between 1961 and 1971 and by the independent researches undertaken by A. K. Srimany in the ICSSR Project. In this respect, we shall, of course, also have to remember the change in definition of workers between the two censuses, 1961 and 1971. But since the non-agricultural sector is more well-defined than the agriculture sector, it indicates that a fair amount of labour displacement has occurred in favour of agriculture. This has been reflected in the last two columns of the Table.

Columns 7 and 8 portray the growth rate of only male cultivators and male agricultural labourers during 1961–71. Female cultivators are not considered as the definitional changes have more seriously affected data of female workers. Nothing very substantive can be said about the relationships of growth rates of cultivators and agricultural labourers to the levels of agricultural productivity, except that (a) a slightly higher rate of growth of male cultivators has occurred in the lowest two levels (below all-India average) than the upper four levels of agricultural productivity (below the national average), and (b) a lower rate of growth of landless agricultural labourers has occurred in the lowest two levels of productivity (below the national average) than the upper four levels (above the national average). In short, more agricultural labourers are created in the higher agricultural productivity levels than in the lower ones. This seems a significant finding.

When the growth rates of immigrants are seen in conjunction with growth rates of non-agricultural employment (column 6) and agricultural employment (column 7), we can easily visualise that compared with higher agricultural productivity levels more migrants have poured into the lower-order productivity districts. That means, more migrants (that includes also dependants) have been absorbed

in the agriculture sector itself, rather than in the non-agriculture sector. This further corroborates the contention of agricultural involution that is taking place in the lower-order productivity districts in India.

Table VII.2 presents the summary results of analysis of variance performed on the basic data given in Table VII.1. Findings show that there are no statistically significant variations in population characteristics among the six agricultural productivity levels. The only statistically significant variation is found between different growth rates (population, urbanization, immigration, and non-agricultural and agricultural employment), which is, of course, as was to be expected and already explained in the preceding discussion. This analysis only confirms what has been already pointed out that high or low agricultural productivity levels in India do not, in aggregated blocks, reveal any significant influence on growth rates of population, immigration, urbanization and non-agricultural or agricultural employment.

Appendix III provides useful district-level data on seven different growth rates, namely, of total population, immigration (immigration in 1961 and in 1971 also given), urban population, non-agricultural workers, male cultivators, and male agricultural labourers during the period 1961–71. These comprise nine variables. Complete information was available only for 274 districts out of 281 selected; the districts being excluded were Greater Bombay, Ropar, Shahabad, Valsad, Jind, Bhandara and Baudh-Khondmals.

Since the aggregated data did not reveal any meaningful relationships between the levels of agricultural productivity and different population growth rates, it was surmised that, as the next step, disaggregated district-level data should be initially examined and employed in the analysis in search of probable relationships.

TABLE VII.2
Analysis of Variance Table

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square SS/DF	F Ratio	Remark
Between productivity levels	5	250.25	50.05	0.44	Not significant
Between growth rates	6	32649.94	5441.66	48.03	Highly significant at 1 per cent level
Residual	30	3398.65	113.29		
Total	41	36298.84			

TABLE VII.3
Simple Correlation Matrix Between Agricultural Characteristics and Population Characteristics, All-India, 1970s (District Level Data : 274 districts)

Sl. No. Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Total population (1971)	1.0																	
2 Agricultural growth rate (1962/65 to 1970/73)	-.10	1.0																
3 Agricultural productivity level (Rupees per hectare, 1970s)	.32**	.39**	1.0															
4 Total food production (Av. of 1970-73)	.58**	.40**	.48**	1.0														
5 Food surplus (1971)	-.07	.51**	.33**	.72**	1.0													
6 Food deficit (1971)	.59**	-.34**	.03	-.05	1.0													
7 Gini concentration ratio of land ownership (1971)	.15*	.05	.07	.09	-.04	1.0												
8 Average NPK Fertilizer (1970-73)	.51**	.19*	.55**	.67**	.42**	.10	1.0											
9 Area irrigated (1970-73)	.43**	.33**	.46**	.81**	.62**	.05	.78**	1.0										
10 Population growth rate, (1961-71)	.15*	.04	.15*	.14*	.02	.06	.19*	.22*	1.0									
11 In-migration, 1961	.48**	.03	.25**	.32**	.12	.46**	.05	.32**	.25**	1.0								
12 In-migration, 1971	.60**	.00	.25**	.38**	.10	.51**	.07	.35**	.27**	.83**	1.0							
13 Growth rate of In-migration, 1961-71	.06	-.11	-.11	-.07	-.15*	.04	-.07	-.03	-.11	.05	.05	1.0						
14 Growth rate of urban population, 1961-71	-.01	-.09	-.10	-.04	-.06	.00	.05	-.14*	-.15*	.31**	.02	.36**	1.0					
15 Growth rate of non-agricultural workers, 1961-71	-.07	-.01	-.02	-.12	-.03	.10	-.16*	.03	-.06	.32**	.19*	.21*	.17*	.14*	1.0			
16 Growth rate of rural population, 1961-71	-.18*	.03	-.16*	-.12	.03	-.02	-.28**	-.23**	-.18*	.78**	-.01	.04	.20*	.03	.21*	1.0		
17 Growth rate of male cultivators, 1961-71	-.21*	-.01	-.21*	-.16*	.01	-.02	-.14*	-.13	-.11	.48**	-.05	-.03	.09	.01	.19*	.61**	1.0	
18 Growth rate of agricultural labourers, 1961-71	-.13	.00	-.08	-.10	.00	-.05	-.06	-.11	-.07	.02	-.08	-.09	.12	.04	-.12	.03	.17*	1.0

*Significant at 5 per cent level.

**Significant at 1 per cent level.

Table VII.3 presents results of simple correlation analysis performed between these nine population variables and the nine agricultural characteristics dealt with in chapter VI (Table VI.1). This comprised a 18 by 18 correlation matrix, of which results of the first 9 by 9 variables have been already discussed. Although many "statistically" significant correlation co-efficients do emerge, these are found to be not at all "practically" significant since their magnitudes are very small and their statistical significance owe simply to a very large sample size taken (N = 274).

Recalling that our primary objective of this exercise was to explore relationships of agricultural growth rates and productivity levels to various population growth rates, it is revealing that relatively very few even statistically significant co-efficients emerge in the top right hand corner of the correlation matrix (that is, between agricultural characteristics and the population characteristics) and whatever significant correlation appears does so only at the bottom right hand corner (that is, between various population growth rates themselves). Note, for instance, consistently significant co-efficients occurring between population growth rate (1961-71) and growth rates of immigration (1961-71), of urban population (1961-71), of non-agricultural workers (1961-71), of rural population (1961-71), and of male cultivators (1961-71). These are obviously axiomatic and we do not need to dwell on them. The only noteworthy positive and significant correlations that have appeared between agricultural characteristics and population characteristics refer to those between food deficit in a district (1971) and the number of immigrants into the district, both in 1961 (0.46) and in 1971 (0.51). Of these two, the former is meaningless as food deficit refers to 1971 time point and immigrants refer to 1961 time point, and as such, this should be ignored. Regarding the latter, since both the variables refer to the same 1971 time point, there appears to exist some kind of inter-relationship. May be that more influx of migrants into a district leads to a greater amount of food deficit. However, any conclusive remark in this regard should await further scrutiny with the help of more fine-grained data.

The absence of high and significant correlation co-efficients between the agricultural growth rate and levels of productivity (1962-65 to 1970-73), on the one hand, and different population growth rates (1961-71), on the other, should be noted. These were further confirmed by the results of bivariate regression analysis performed between them and which yielded no significant findings. In short, no meaningful relationships between, agricultural processes and population processes were revealed from the present exercise. The only statistically significant values of R^2 (co-efficient of multiple determination), but of very low magnitude, have emerged between the Gini concentration ratio of land ownership (1971) and population growth rate 1961-71 ($R^2 = 0.055$), and also with growth rate of rural population, 1961-71 ($R^2 = 0.08$), and growth rate of male cultivators, 1961-71 ($R^2 = 0.02$). These results rather feebly confirm the common sense hypothesis that accelerating pressure of agricultural population on the meagre amount of land available results in increasing inequality in land ownership. But it would be unwise to make much of this not only because of the very low values of R^2 but also because of the fact that while the growth rates were for 1961-71, the Gini figures were based on 1971.

In sum, the results of this present correlational and regression analysis between nine population variables and nine agricultural variable showed no significant relationship of any practical value between the agricultural growth rates (also level of agricultural productivity) and the various population growth rates. But even the absence of any relationship is worth reporting and the data are here presented in that spirit. What may be happening is a kind of static expansion of numbers in every segment without any dynamic or structural change in the economy or the population. The fault of the present exercise may as well lie in using the gross aggregated census data, albeit at the district level and, particularly, the unsatisfactoriness of the migration data. We have noted this at the outset in the Preface. The main intention in this chapter, while presenting the negative finding, is to draw attention to the problem which certainly presents a challenge.

Variation of Agricultural Inputs in Food Surplus and Food Deficit Districts

We have seen how Indian agriculture is still heavily dependent for the production of agricultural wealth, first, on human labour and, secondly, on whatever water is available by way of irrigation. The lessons on the correct amount of water to be used and particularly on the conservation of water are still to be universally learnt. The contribution of high-yielding seeds has not been separately assessed in this exercise but there is enough of evidence to confirm that the message is spreading rather rapidly throughout the length and breadth of the land. There is also evidence that the message of fertilizers has been heeded. But the chief impediment to the more extensive use of fertilizers and of pesticide is lack of extension education and, what is more, of their availability and accessibility, and the lack of institutional facilities, often of the most elementary kind, which have the effect, in addition to their lack, of converting them into scarce commodities available only to the rich or politically resourceful peasant. The message of improved agricultural implements,

mechanization and post-harvest technology has still to be vigorously and widely propagated. That the message of irrigation has been absorbed is borne out by the following two Tables VIII.1 and VIII.2 which illustrate the relationship of irrigation to the creation of food surpluses and food deficits. Table VIII.1 shows how the total amount of food surplus in food surplus districts increases progressively with the mean irrigated area. The picture in Table VIII.2 shows almost equally conclusively in the opposite direction how the total food deficit in food deficit districts progressively decreases with increase in the mean irrigated area. The two districts at the top with deficits of 600,000 tonnes and above but with a high measure of mean irrigated area and which run counter to the trend of Table VIII.2 are (a) the Kozhikode-Malappuram-Palghat-Ernakulam-Kottayam group of districts in Kerala (deficit 780,538 tonnes) and (b) Greater Bombay (deficit 920,900 tonnes), both of which suffer from exceptionally high population densities and urban sprawl.

TABLE VIII.1
Distribution of Irrigation in 180 Food Surplus Districts

Surplus Category	Number of Districts	Total Irrigated Areas (in hectares) (av. of 1970-73)	Mean Irrigated Area (in hectares)
600,000 tonnes and above	7	39,10,546	5,58,649
400,001-600,000 tonnes	5	18,85,300	3,77,060
300,001-400,000 tonnes	8	24,18,344	3,02,293
200,001-300,000 tonnes	15	21,59,122	1,43,941
100,001-200,000 tonnes	43	47,39,499	1,10,221
100,000 tonnes and below	102	97,45,540	95,545

TABLE VIII.2
Distribution of Irrigation in 101 Food Deficit Districts

Deficit Category	Number of Districts	Total Irrigated Areas (in hectares) (av. of 1970-73)	Mean Irrigated Area (in hectares)
600,000 tonnes and above	2	2,78,708	1,39,354
400,001-600,000 tonnes	1	28,747	28,747
300,001-400,000 tonnes	3	2,11,239	70,413
200,001-300,000 tonnes	9	8,54,824	94,980
100,001-200,000 tonnes	21	20,25,814	95,756
100,000 tonnes and below	65	74,63,723	1,14,827

Similarly, Tables VIII.3 and VIII.4 will show that the message of NPK fertilizers is fast being learnt. Table VIII.3 shows how the average use of NPK fertilizer progressively increases with the production of food surpluses in food surplus districts. Conversely, Table VIII.4 shows how the average use of NPK

fertilizer is inversely related to the dimension of food deficits in food deficit districts. (The district with a deficit of 580,207 tonnes in the range 400,000-600,000 is 24-Parganas in West Bengal, which explains its out-of-line behaviour).

TABLE VIII.3
Distribution of NPK Fertilizers in 180 Food Surplus Districts

Surplus Category	Number of Districts	Total NPK Fertilizer used (av. of 1970-73) (Tonnes)	Mean NPK Fertilizer used (Tonnes)
600,000 tonnes and above	7	2,33,137	33,305
400,001-600,000 tonnes	5	1,09,017	21,803
300,001-400,000 tonnes	8	1,17,183	14,648
200,001-300,000 tonnes	15	1,15,410	7,694
100,001-200,000 tonnes	43	2,93,061	6,815
100,000 tonnes and below	102	6,46,019	6,334

TABLE VIII.4
Distribution of NPK Fertilizers in 101 Food Deficit Districts

Deficit Category	Number of Districts	Total NPK Fertilizer used (av. of 1970-73) (Tonnes)	Mean NPK Fertilizer used (Tonnes)
600,000 tonnes and above	2	18,337	9,169
400,001-600,000 tonnes	1	7,796	7,796
300,001-400,000 tonnes	3	25,017	8,339
200,001-300,000 tonnes	9	75,458	8,384
100,001-200,000 tonnes	21	1,98,461	9,541
100,000 tonnes and below	65	5,33,199	8,203

Effects of Inequality in Land Ownership on Agricultural Development in India

1. Data

The discussion towards the end of the last chapter brings us to one of our major queries of the present investigation: whether or not the existing inequality in the pattern of land ownership in India does adversely affect her agricultural development and her efforts to generate food surplus at the district level. Or, when seen in a reverse way, does a higher concentration of land ownership in a few hands really help augment agricultural productivity and growth rates in a developing economy? These crucial questions cry out for an answer before any inquiry into population, malnutrition and agricultural productivity of India can ever be considered complete. In this concluding chapter, we shall look for what answers our rather unsatisfactory data may provide to these fundamental questions.

As already observed earlier, this study would have been more worthwhile had we had a reliable record district by district of size of land actually cultivated, i.e. of operational holdings. But except for a number of NSS rounds which give us this information with a certain degree of reliability but only for large blocks of the country and not district by district, information on operational holdings, particularly when collected by government agencies through the village land record keepers, is so biased and undependable that we had to reject the information on this subject provided by the Agricultural Census of India, 1971. The Census of landholdings conducted by the Registrar General, India in 1961, compiled by census takers who in many parts of the country were not landrecord keepers, is one of the most dependable as demonstrated by P. S. Sharma, formerly of the Registrar General's Office and now of the Planning Commission in his researches. But that information was ten years out of date for our study.

What analysis has gone before in earlier chapters to determine relationships between Gini concentration ratios of land ownership on the one hand and

V. S. Gahlaut, Research Officer, assisted in the preparation of the five summary tables presented in this chapter and prepared three useful Appendices IV, V and VI which are his independent contribution. He was helped by Research Assistants A. K. Anand, Savitri Rawat, Nandita Pradhan, Janak Singh and Amar Singh.

agricultural characteristics on the other (e.g., area irrigated, fertilizers used, agricultural growth rate, agricultural productivity, food surplus or deficit) did not yield any conclusive results.

The difficulties of applying the Gini ratios of concentration of operational holdings to the preference of that of land owned, have been explained earlier. Many institutional, cultural, economic and practical forces exist which have been thwarting a clear articulation of relationship, either positive or negative, between the Gini concentration ratio of land ownership and agricultural production performances. The applicability of the Gini ratios of concentration of land owned in such statistical exercises is fraught among others with five major imponderables: (1) the peculiarly complex structure of land ownership in India, with its numerous local variations topped by the states claiming what amounts to a proprietary right to "rent"; (2) the surviving elements, despite land reforms and the 'abolition of intermediaries', of a class of 'non-cultivating proprietary right-holders', who continue to take substantial rents from the working peasantry; (3) the consequent persistence of a considerable gap between ownership and the physical cultivation of land; (4) the actual cultivation of land by tillers who are chronically and seriously short of physical capital and financial resources, and (5) limited use of improved implements and low yields. These five main factors put considerable impediments in the way of possible clear relationships between concentration ratios of land ownership on the one hand and agricultural productivity, access to and use of inputs or technological innovation on the other.

In spite of these contrary factors, we have attempted here to assess by a number of aggregated arrangements of the data by Gini class ranges whether or not high or low degrees of inequality in the land ownership pattern affect the afore-mentioned indices of agricultural growth and development. The calculation of Gini concentration ratios of land ownership pattern for as many as 277 selected districts of India is itself a tremendous task which was not attempted before.

Next, we divided the distribution of Gini ratios into

12 categories and tabulated the characteristics and attributes of agricultural performances of the group of districts falling into those Gini ranges. Summary Tables IX. 1 to IX. 4 present broad overviews of these characteristics and relationships. Here, all the 275 selected districts of India, for which detailed land ownership data were available, were re-grouped according to twelve levels of Gini concentration ratios.* Five districts fall into the category of 0.360 to 0.385 Gini levels; four districts fall into category of 0.386 to 0.411 Gini level; nine districts belong to 0.412 to 0.437 Gini levels; twelve districts lie in 0.438 to 0.463 category; thirtytwo districts in 0.464 to 0.489 category; thirtyeight districts in 0.490 to 0.515 category; fortyone districts in 0.516 to 0.541 category; as many as fortyfive districts in 0.542 to 0.567 category; thirtysix districts in 0.568 to 0.593 category; twentyseven districts in 0.594 to 0.619 category; sixteen districts in 0.620 to 0.645 category; and ten districts record Gini level between 0.646 and 0.671.

The four Tables (IX. 1 to IX. 4) show respectively the following aspects:

- (1) agricultural and population characteristics of 275 selected districts classified according to twelve levels of Gini ratio of concentration of land ownership in India in 1971;
- (2) mean agricultural performance of 275 districts classified according to the same Gini levels and averaged by the number of districts falling into respective Gini class interval (that is, the table shows average performance per district);
- (3) average agricultural performances of 275 districts classified according to the same Gini level, but averaged by the gross cropped area (in hectares) of the cluster of districts falling into each class (that is, the tables shows average performance per hectare of gross cropped area, and as such, it is more revealing than the table noted above); and
- (4) average characteristics of agricultural inputs (fertilizer and irrigation) and labour inputs available per hectare of gross cropped area.

2. Unknown Domain

We do not have enough knowledge of what features of agricultural productivity can be explained by Gini concentration ratios. So any categorical interpretation is ruled out. Any trends that may appear in the

*For the sake of convenience, the two extreme cases in the distribution, the districts of Alwar (having Gini ratio of 0.771) and of Junagarh (having Gini ratio of 0.227) were not considered in the tables.

four summary tables may be entirely fortuitous, especially when the relationship between the Gini ratios on the one hand and any other indices of agricultural performance on the other does not show any clearcut linear trend, either positive or negative. There appears to be an irregular curvilinear relationship and fluctuations which are suggestive of the operation of many factors not properly identified.

Another matter needs mention. Positive or negative effects of new agricultural institutions, like Green Revolution, small and marginal farmers development programme, credit services and loans advanced to agricultural sector, etc., upon productivity and management of agriculture and upon land ownership and tenancy pattern are yet not properly investigated and well understood. We still do not know for certain the precise answers to some of the crucial questions involved, for instance, to what extent such new agricultural institutions and innovations are inducing changes in the present-day inequitous distribution of land ownership. Whether or not those agricultural institutions have any 'trickle-down effect' upon agricultural management and productivity at the lowest level of ownership. Or do they further aggravate the problem of land inequality? Conversely, do such institutions enhance overall productivity? Such questions need serious attention and investigation before any conclusive deductions can be expected or inferred from the summary tables that are presented in this chapter as the first faltering steps towards unravelling a complex reality.

Further scrutiny revealed that within the second through the fifth Gini levels (i.e. 0.386 to 0.411, 0.412 to 0.437, 0.438 to 0.463, and 0.464 to 0.489) one can delineate two completely different clusters of districts:

- (a) 23 more physically endowed districts in terms of favourable terrain, fertile soil, easily available underground water and adequate rainfall, and
- (b) 34 less physically endowed districts which are characterized by a rocky and undulating surface, less fertile soil and subsoil, inaccessible underground water and inadequate rainfall.

Appendix IV provides the details. Although they have the same Gini ranges, these clusters of districts show marked differences between themselves in regard to agricultural growth rates, agricultural productivity, inputs used, etc. As may be repeatedly seen from the four tables, when the less endowed districts are grouped together with relatively more endowed ones, their overall performances are dampened.

Curiously enough, the fiftyseven districts falling within the Gini levels (0.386 to 0.489), taken together,

record very low average agricultural growth rate (ranging between 0.83 and -2.07) and low agricultural productivity (ranging between Rs. 667 and Rs. 1058). These 57 districts as an integral group pose problem to the above-mentioned contention that the less the inequality in land ownership, the higher the agricultural growth rate (Table IX.1, column 6) and higher agricultural productivity per hectare (Table IX.1, column 7).

An account of each of these 57 districts along with their physical and climatic endowments is given in Appendix IV. It has been found that 34 districts, out of a total of 57, are climatically and physically, less endowed than the remaining 23 districts. Their growth rate and productivity per hectare are also very low. When the 57 districts are grouped together, albeit in four Gini levels, including 34 less privileged districts, the defects in their endowments blur the general inverse relationship that emerge between land inequality, agricultural productivity and food surplus. If, however, we exclude these 34 less endowed districts, the group of the remaining 23 districts may show that they, as a group, enjoy a quite high rate of growth, bringing the growth pattern more or less in line with an inverse relationship between land ownership and growth rates. Similarly, a sudden drop also occurs in other types of agricultural performances (e.g. net foodgrain production, amount of food surplus, etc.)

which are also noticeable within this segment of the Gini ranges (0.386 to 0.489) (see Table IX.3, columns 9-14).

3. General Description of the Groups of Districts falling into 12 Gini Ranges

Keeping in mind this unknown domain and lack of our knowledge about the inter-relationships between the index of land inequality and agricultural performances, nevertheless, brief descriptions of each of the summary tables may be pertinent here (Appendix V which lists clusters of districts and isolated districts falling into the four major Gini levels may also be consulted).

Summary Table IX.1 provides the details of the population and agricultural characteristics of 275 selected districts classified according to the ascending order of 12 Gini ranges. The table provides a comparative picture of the extent to which the group of districts belonging to each respective Gini ranges share the total population burden and contribute to the national foodgrains production, food surplus or food deficit. Their share of the total irrigated area and chemical fertilizers is also shown.

The most significant observation emerging from summary Table IX.1 is that of column 6 which indicates a more or less inverse relationship between

TABLE IX.1
Summary Table of Agricultural Characteristics of 275 Selected Districts Classified According to Levels of Concentration of Land Ownership, India, 1971

Sl. No.	Gini level	No. of districts	Total population	Population as per cent of total 275 districts	Average agricultural growth rate	Average agricultural productivity (Rs./hectare)	Total foodgrain production (tonnes)	Foodgrain production as per cent of total 275 districts	Total food surplus (tonnes)	Food surplus as per cent of total 275 districts	Total food deficit (tonnes)	Food deficit as per cent of total 275 districts
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	0.360-0.385	5	9,022,377	1.81	4.16	1,351	1,984,727	2.19	756,383	3.10	143,662	1.36
2.	0.386-0.411	4	4,083,968	0.82	0.57	667	595,618	0.66	38,270	0.16	58,620	0.55
3.	0.412-0.437	9	13,457,431	2.69	-2.07	607	2,020,218	2.23	416,153	1.70	438,403	4.14
4.	0.438-0.463	12	17,269,903	3.46	-0.59	877	2,807,476	3.10	732,461	3.00	543,092	5.13
5.	0.464-0.489	32	64,362,542	12.89	0.83	1,058	10,033,980	11.09	2,011,675	8.24	1,699,671	16.07
6.	0.490-0.515	38	60,948,527	12.21	2.51	1,007	12,846,109	14.20	4,952,909	20.28	1,179,592	11.15
7.	0.516-0.541	41	64,832,521	12.98	2.47	934	14,509,915	16.04	5,796,667	23.74	858,878	8.12
8.	0.542-0.567	45	76,700,188	15.36	2.32	1,037	15,086,631	16.67	4,394,448	18.90	975,440	9.22
9.	0.568-0.593	36	77,483,626	15.52	1.52	1,128	13,706,206	15.15	2,667,905	10.93	2,174,921	20.56
10.	0.594-0.619	27	54,334,316	10.88	1.45	1,116	9,101,540	10.06	1,530,363	6.27	661,149	6.25
11.	0.620-0.645	16	37,269,349	7.47	1.24	1,038	4,872,070	5.38	583,585	2.39	1,333,187	12.60
12.	0.646-0.671	10	19,513,399	3.91	0.49	969	2,919,225	3.23	535,024	2.19	513,345	4.85
Total for 275 districts		275	499,278,147	100.00	1.61	1,017	90,483,715	100.00	24,415,843	100.00	10,579,965	100.00

TABLE IX.1 (Concl.)

Sl. No.	Gini level	No. of districts	Total gross cropped area of all crops (hectares)	Gross cropped area of all crops as per cent of total 275 districts	Total gross cropped area of nine foodgrain crops (hectares)	Gross cropped area of nine foodgrain crops as per cent of total 275 districts	Total average N.P.K. fertilizer (tonnes)	Average N.P.K. fertilizers as per cent of total 275 districts	Total area irrigated (hectares)	Irrigated area as per cent of total 275 districts
1	2	3	14	15	16	17	18	19	20	21
1.	0.360-0.385	5	2,797,042	2.28	1,626,905	1.64	89,850	3.82	1,409,010	3.89
2.	0.386-0.411	4	1,723,384	1.41	1,190,036	1.20	28,635	1.22	132,591	0.37
3.	0.412-0.437	9	5,030,138	4.10	3,544,302	3.57	45,316	1.92	496,656	1.37
4.	0.438-0.463	12	4,959,391	4.04	3,864,640	3.90	42,100	1.79	623,231	1.72
5.	0.464-0.489	32	16,205,021	13.22	12,185,659	12.28	239,868	10.19	3,180,358	8.78
6.	0.490-0.515	38	17,064,640	13.92	14,159,191	14.27	322,200	13.69	5,643,933	15.57
7.	0.516-0.541	41	18,345,964	14.96	15,116,165	15.24	340,784	14.47	5,875,736	16.21
8.	0.542-0.567	45	18,667,003	15.22	15,487,448	15.61	379,169	16.10	6,104,670	16.85
9.	0.568-0.593	36	16,800,641	13.70	13,754,946	13.87	487,796	20.72	6,661,082	18.38
10.	0.594-0.619	27	11,491,768	9.37	9,800,989	9.88	229,351	9.74	3,841,413	10.60
11.	0.620-0.645	16	5,847,216	4.77	5,174,092	5.22	108,896	4.62	1,529,422	4.22
12.	0.646-0.671	10	3,688,360	3.01	3,298,886	3.32	40,472	1.72	740,872	2.04
Total for 275 districts		275	122,620,568	100.00	99,203,219	100.00	2,354,437	100.00	36,238,974	100.00

agricultural growth rate and Gini concentration ratio of land ownership. Of course, there are a few exceptions to this pattern and these appear between Gini level 0.386-0.489, but these are the problematic districts, as mentioned before. In general, it appears that agricultural growth rate seems to thrive on less land inequality and suffer from the present state of more concentration of land ownership in a few hands. This result is an argument in favour of implementation of land reform and lowering of land ceiling to reduce land inequality.

The levels of agricultural productivity, however, do not exhibit a similar trend, nor do they show a clear positive relationship with concentration ratios of land ownership. No doubt, productivity per hectare is maximum in the lowest Gini levels (Rs. 1,351 in the first level). Except for those problematic 57 districts, for which average productivity is only around Rs. 600-900 per hectare, productivity on the whole decreases as one goes higher up the scale of land inequality: Rs. 1,058 in fifth category, Rs. 1,001 in the sixth, Rs. 934 in the seventh, then with some more fluctuations, it finally drops to Rs. 999 in the highest inequality category.

The above kind of fluctuating trends can be seen with respect to food surplus, food deficit and net food surplus, as we shall see in other summary tables (IX.2 to IX.4) discussed in later sections.

Only five districts fall in the category of very low Gini level 0.360-0.385. These are inhabited by only 9

million people and thus share only 1.81 per cent of the country's total population. But both the agricultural growth rate (4.16 per cent) and agricultural productivity per hectare (Rs. 1,531) are very high; indeed their growth rate is the highest of all districts. These districts support 1.81 per cent of the total population and produce 2.19 per cent of the total foodgrains of the country. This is impressive. These districts enjoy 2.28 per cent of the country's total gross cropped area (col. 15), 3.82 per cent of total NPK fertilizers (col. 19) and 3.89 per cent of net irrigated land (col. 21) and are able to generate 3.10 per cent of total food surplus of the country (col. 11). Consequently their share of the food deficit is small: only 1.36 per cent of the country's total food deficit (col.13).

The twentyfive districts fall into the next three Gini ranges (0.386 to 0.463) and they indicate a sudden drop in agriculture growth rate and level of productivity. Although these districts belong to three separate Gini levels, a remarkable similarity in their characteristics is noticeable. As such, it would be profitable to discuss them together. These are the problem districts, mostly lying in the Central Indian plateau and Ridge region, which extends from Gujarat in the West, through Maharashtra and Madhya Pradesh, to Orissa and Bihar in the West, or almost bordering West Bengal. As mentioned earlier, the land-form of these twentyfive districts is rocky and mountainous, the terrain undulating and denuded,

bedrock is near to surface and subsoil thin, underground water is largely untapped, rainfall is inadequate as well as variable (see Appendix IV). As a consequence, the agricultural growth rate is very low (0.57) or even negative (-2.07) and agricultural productivity is among the lowest in India (Rs. 607 to Rs. 877 per hectare). Food production of these twenty-five districts, taken together, comprises only 5.99 per cent of the country's total production and food surplus is even less—only 4.86 per cent, both ratios falling below the proportion (6.97 per cent) of population this category of districts holds of the country's total population. In spite of enjoying about 10 per cent of total gross cropped area these clusters of districts fail to produce enough food. Although this is mainly due to climatic and physical vicissitudes, this is also due to the fact that they share only 4.93 per cent of total chemical fertilizers and only 3.46 per cent of net irrigation. Per hectare productivity and growth rate touch a low trough in this group. Indeed, irrigation is most inadequately available to these 25 less endowed, dry and rocky districts. The watchword for development of this region, then, must be "irrigation".

Thirty-two districts fall in the category of those having a Gini level ranging between 0.464 and 0.489. These districts contain 64 million people or 12.89 per cent of the country's total population and produce 11.02 per cent of the nation's total food production and 8.24 per cent of India's total food surplus. Agricultural growth rate is much less than that of the lowest Gini category (0.83 per cent), but agricultural productivity is one of the highest among the Gini categories (Rs. 1,058 per hectare). These clusters of districts have 13.22 per cent of total gross cropped area, 10.19 per cent NPK fertilizers and 8.78 per cent of all irrigated land. It is intriguing that these 32 districts, which manage to have relatively sizable proportions of fertilizers and irrigation, are not being able to generate an equivalent amount of net food production and food surplus than what might be expected from their population share or acreage under crops. Indeed certain districts within this category also suffer from food deficit. Their food deficit share (16.07 per cent) exceeds the population share (13.22 per cent). In fact, nine districts out of these thirty-two districts also suffer from the same kind of limitations as the twenty-five less endowed districts just mentioned above.

On the other hand, the districts which have a middle level Gini ratios (0.490 to 0.515) portray a brighter picture of large food surplus compared to their proportion of population. Sixty million people live in districts of this category, sharing 12.21 per cent of the total population. The total food surplus is 4.95

million tonnes or 20.28 per cent of the country's total surplus. That is quite remarkable.

In the next higher Gini level (0.516 to 0.541) there are as many as 41 districts out of a total of 275. These districts support 64.8 million people, share 13 per cent of the country's total population, produce 16 per cent of total foodgrains, enjoy 15 per cent of net gross cropped area, use 13.69 per cent of all chemical fertilizers, and enjoy 15.57 per cent of all irrigated land. But neither agricultural growth rate (2.47 per cent) nor productivity per hectare (Rs. 934) is very impressive. These two indices fall below the level found in the next lower Gini category just mentioned in the above paragraph. However, this group of 41 districts produces 23.74 per cent of net food surplus, the highest contribution to India's total food surplus. The amount of food deficit is also relatively low (8.12 per cent).

Almost similar trends emerge for the group of 45 districts that fall into the eight Gini ranges, that is, 0.542 to 0.567. There are very close resemblances in almost all respects between this cluster of districts and the cluster of 41 districts which belong to the seventh Gini ranges.

The ninth Gini category (ranging between 0.568 and 0.593) also closely resembles the former two categories except that this cluster of 36 districts suffers from a large amount of food deficit and contributes to the largest share of the national total food deficit (20.56 per cent). Albeit there is a mounting population pressure (77 million, or 15.5 per cent), but the agricultural growth rate is also comparatively much lower (only 1.52 per cent). It is quite clear that within this group lie a large number of districts suffering from a low level of agricultural growth rate and a high degree of food deficit.

In the last three categories of very high Gini levels (0.594 to 0.671) fall as many as 53 districts. These three categories show clearcut declining trends in both agriculture growth rate and productivity as the Gini level or degree of land inequality increases. As such, these three clusters of districts are discussed together, though their individual characteristics must also be examined separately from the table. This group of districts is inhabited by 111 million people. They share 22.3 per cent of total population, but are able to produce only 18.5 per cent of India's total food production. As a result, their contribution to the country's total food deficit is also very high (23.7 per cent). Agricultural growth rates are low, ranging only between 0.49 and 1.45 per cent. However, agricultural productivity per hectare is not unimpressive, around Rs. 1,041. These 53 districts testify to the fact, as indicated earlier, that in India agricultural productivity may reach a high level without contributing

much to raising the overall agricultural growth rate. This group of districts enjoys 17.2 per cent of total gross cropped area, 16.0 per cent of all chemical fertilizers and 16.8 per cent of land irrigated; but, despite these shares, the proportionate contribution to the total food surplus of the country is comparatively low (only 10.85 per cent), while the proportion of food deficit is remarkably high (23.7 per cent).

In sum, these 53 districts which belong to the highest three-land inequality levels, along with the above mentioned 34 districts which are physically less endowed (in spite of their relatively favourable position in land equality), that is, a total of 87 districts are the main problem areas in India. Much greater emphasis awaits to be given on augmenting their present-day low agricultural growth rate, low productivity level and low overall food surplus. While the watchword of agricultural planning for the latter group of 34 districts should be to provide more irrigation, the catalyst of change for the former 53 districts might well come through a rigorous implementation of land reforms to bring down the proportion of land concentration in a few hands.

4. Inequality in Land Ownership and Average Agricultural Characteristics per District

Summary Table IX.2 shows mean agricultural characteristics according to Gini levels, averaged by the number of districts occurring in respective levels. That way it unfolds a few new features compared with the information given in Table IX.1 (which shows percentage share to the national total). The main features from this table are briefly listed below:

- Population size per district (col. 4) is relatively low in the lower Gini levels (around 1.50 million persons). It shows many fluctuations in middle level Gini ratios. However, as one goes up the scale of Gini level and reaches the higher land inequality level of 0.568 and above the population size per district is 2 million persons. More crowding appears to have occurred in the districts of higher land inequality.
- Average foodgrain production per district does not vary perceptively from one Gini level to another, except in the second to fourth levels (col.9). It is highest in the first category (being 0.4 million tonnes per district), goes down to as low as 0.14 million tonnes in second category, then rises again to 0.22 million tonnes in the next level and continues around 0.30 million

TABLE IX.2
Summary Table of Mean Agricultural Characteristics of 275 Districts Classified According to Gini Levels and Averaged by the Number of Districts in Respective Gini Level, India 1971

ARITHMETIC MEAN												
Sl. No.	Gini level	No. of districts	Population	Average agricultural growth rate	Average agricultural productivity (Rs./hectares)	Gross cropped area for all crops (hectares)	Gross cropped area for nine food-grains crops (hectares)	Foodgrain production (tonnes)	N.P.K. fertilizers (tonnes)	Area irrigated for all crops (hectares)	Food surplus (tonnes)	Food deficit (tonnes)
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	0.360-0.385	5	1,804,675	4.16	1,351	559,408	325,381	396,945	17,970	281,802	151,277	28,742
2.	0.386-0.411	4	1,020,992	0.57	667	430,846	297,509	148,905	7,159	33,148	9,568	14,655
3.	0.412-0.437	9	1,495,270	-2.07	607	558,904	393,811	224,218	5,035	55,184	46,239	48,712
4.	0.438-0.463	12	1,439,159	-0.59	877	413,283	322,053	233,956	3,508	51,936	61,038	45,258
5.	0.464-0.489	32	2,011,329	0.83	1,058	506,407	380,802	313,562	7,496	99,386	62,865	53,115
6.	0.490-0.515	38	1,603,909	2.51	1,007	449,069	372,609	338,056	8,479	148,525	130,340	31,042
7.	0.516-0.541	41	1,581,281	2.47	934	447,463	368,687	353,900	8,312	143,311	141,382	20,948
8.	0.542-0.567	45	1,704,449	2.32	1,037	414,822	344,166	335,258	8,426	135,659	97,654	21,676
9.	0.568-0.593	36	2,152,323	1.52	1,128	466,684	382,082	380,728	13,550	185,030	74,108	60,414
10.	0.594-0.619	27	2,012,382	1.45	1,116	425,621	363,000	337,094	8,494	142,275	56,680	24,487
11.	0.620-0.645	16	2,329,334	1.24	1,038	365,451	323,381	304,504	6,806	95,589	36,474	83,324
12.	0.646-0.671	10	1,951,340	0.49	969	368,836	329,889	291,923	4,047	74,087	53,502	51,335
Total for 275 districts		275	1,815,561	1.61	1,017	445,893	360,739	329,032	8,562	131,778	88,785	38,473

tonnes almost in all of the remaining Gini levels. The production might have been affected by the variation in the gross cropped area available to each district. This is the subject matter of scrutiny of the next table.

- (c) Average use of chemical fertilizers is highest in the lowest land inequality region (17,970 tonnes per district), and with some fluctuations it decreases to a much lower level in the highest Gini level (only 4047 tonnes per district). Although no clear trend emerges, there is a faint suggestion of an inverse relationship between the two (col. 10).
- (d) In respect of food surplus (col. 12), the districts enjoying more equality in land ownership generate much more surplus (151,277 tonnes per district in the first Gini category and about 120,000 tonnes in the middle level Gini categories) than the districts which suffer higher inequality in land ownership (only 53,502 tonnes per district in the highest Gini category).
- (e) The trend pattern with respect to the distribution of food deficit (col. 13) does not reveal any clear-cut picture. Many troughs and peaks in

the distribution of food deficit appear to have occurred in relation to various Gini levels.

5. Inequality in Land Ownership and Average Agricultural Characteristics per Hectare of Gross Cropped Area

Since the districts vary in terms of their gross cropped area, the findings of Table IX.2 would be more meaningful and more comparable across the Gini levels, if we averaged those agricultural characteristics by taking in the denominator the total gross cropped area of group of districts falling into respective Gini levels, instead of merely their number. Summary Tables IX.3 and IX.4 serve this purpose; they show the mean agricultural indices when these are calibrated by the total gross cropped area of groups of districts belonging to each respective Gini level.

Table IX.3 brings out many intriguing features. First of all, population density (col. 6) is lowest in the least land inequality districts (i.e. Gini level 0.360-0.386), and almost linearly increases as the Gini level increases, except for the 12 districts in the second and third Gini levels where it is comparatively low (cols. 6

TABLE IX.3

Summary Table of Average Characteristics of Agricultural Characteristics of 275 Selected Districts per Hectare of Gross Cropped Area Classified According to Levels of Gini Ratios of Concentration of Land Ownership, India, 1971

Sl. No.	Gini level	No. of districts	Total gross cropped area for all crops (hectares)	Total gross cropped area for nine food-grain crops (hectares)	Population density (persons per hectare of gross cropped area)	Population density (persons per hectare of gross cropped area for nine foodgrain crops)	Average food surplus (per hectare of gross cropped area for nine foodgrain crops in Kg.)	Average food surplus (per hectare of gross cropped area for nine foodgrain crops in Kg.)	Average food deficit (per hectare of gross cropped area for nine foodgrain crops in Kg.)	Net food surplus/deficit (tonnes)	Net food surplus/deficit (per hectare of gross cropped area for nine foodgrain crops in Kg.)	Per capita food surplus per hectare of gross cropped area (Kg.)	Per capita food deficit per hectare of gross cropped area (Kg.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	0.360-0.385	5	2,797,042	1,626,905	3.23	5.55	1220	465	88	612,721	377	83.78	15.86
2.	0.386-0.411	4	1,723,384	1,190,036	2.37	3.43	501	32	49	-20,350	-17	9.33	14.29
3.	0.412-0.437	9	5,030,138	3,544,302	2.68	3.80	570	47	124	-22,255	-7	30.79	32.63
4.	0.438-0.463	12	4,959,391	3,864,640	3.48	4.47	726	190	141	189,369	49	42.51	31.54
5.	0.464-0.489	32	16,205,021	12,185,659	3.97	5.28	823	165	139	312,004	26	31.25	26.33
6.	0.490-0.515	38	17,064,640	14,159,151	3.57	4.31	907	350	83	3,773,317	267	81.21	19.26
7.	0.516-0.541	41	18,345,964	15,116,165	3.53	4.29	960	383	57	4,937,789	326	89.28	13.29
8.	0.542-0.567	45	18,667,003	15,487,448	4.11	4.95	974	284	63	3,419,008	221	57.37	12.73
9.	0.568-0.593	36	16,800,641	13,754,946	4.61	5.63	996	194	158	492,984	36	34.46	28.06
10.	0.594-0.619	27	11,491,768	9,800,989	4.73	5.54	929	156	67	869,214	89	28.16	12.09
11.	0.620-0.645	16	5,847,216	5,174,092	6.37	7.20	942	113	258	-749,602	-145	15.69	35.83
12.	0.646-0.671	10	3,688,360	3,298,886	5.29	5.92	885	162	156	21,679	6	27.36	26.35
Total for 275 districts		275	122,620,568	99,203,219	4.07	5.03	912	246	107	13,835,878	139	48.91	21.27

and 7). Only 3.23 persons per hectare live in the lowest Gini level districts, while as many as 6.37 and 5.29 persons per hectare crowd in two levels of highest land inequality. Greater population pressure per unit of cultivated land seems to have led to greater concentration of land in fewer hands. This is one of the essential characteristics of *minifundia*.

However, average foodgrain production (in column 8) does not conform straightforwardly to the trend mentioned above. Here average foodgrain production per hectare of gross cropped area is, of course, highest, 1220 kg. in the lowest Gini level, but drops to 501 kg. in the next Gini level, then gradually increases to around 996 kg. in the middle Gini levels, and finally decreases to 885 kg. at the highest Gini level. It is obvious that average food production of the first Gini category is much higher (1220 kg. per hectare of gross cropped area) than that of the highest two Gini levels (942 and 885 kg., respectively). This does not warrant hasty conclusions, however.

Average food surplus per hectare of gross cropped area (col. 9) is highest (465 kg.) in the districts of the lowest Gini level and it is much lower (162 kg.) in districts with the highest Gini ratios. In between, however, there are some fluctuations; troughs occurring between 0.386 and 0.489 Gini levels and peaks occurring between 0.490 and 0.567 Gini levels. At the latter, the amount of food surplus available per hectare of gross cropped area is around 300-400 kg. and is much more than that occurring in the groups of districts with still higher degree of land inequality. In other words, food surpluses are more in evidence in areas of less or middle level land inequality.

Average food deficit (col. 10) is comparatively less in amount (88 kg.) in the lowest Gini range of districts and is much higher (258 kg. and 156 kg.) in the highest two Gini categories. Of course, there are many variations in between.

Regarding net food surplus (col. 12), the lowest Gini range districts provide on an average 377 kg. of food surplus per hectare of gross cropped area, whereas the highest Gini range districts provide only 6 kg. per hectare of gross cropped area, or even show net food deficit of -145 kg. per hectare. However, districts with middle level Gini ranges also provide approximately 200-300 kg. of surplus per hectare.

These phenomena presumably have much to do with the mounting pressure of population per unit of land cultivated as one moves from the lowest Gini ranges to the highest. As such, columns 13 and 14 in Table IX.3 are calculated which show the amount of per capita food surplus and per capita food deficit occurring in respective Gini levels. When the effect of

population factor is also eliminated (the effects of a real variation in the size of districts had also been eliminated right from the beginning), the results, however, corroborate more or less the same trend patterns. That is, in general, a greater amount of food surplus is found to be available per person per hectare of gross cropped area in the lowest and middle-level land-inequality districts (on average 60-85 kg.) than that available in the districts with higher or highest Gini ranges. Conversely, lesser amounts of food deficit per person per hectare of gross cropped area are found in the districts with lower and middle-level Gini ratios (on average 20-39 kg.) than those districts which are characterised by higher and highest level Gini ratios.

6. Land Inequality, Agricultural Inputs and Human Labour

Summary Table IX.4 shows average characteristics of agricultural inputs (like fertilizers and irrigation) and human labour utilised per hectare of gross cropped area in the clusters of districts grouped according to rising order of Gini values. These are some of the interesting findings:

- Contrary to popular notions, chemical fertilizer is more used per hectare of gross cropped area in the lower and middle-level land inequality districts than in the higher land inequality districts (column 4).
- Irrigation, likewise, is more practised per hectare of gross cropped area in the lower and middle-level land inequality districts than in the higher land inequality districts (column 5).
- The number of male or female cultivators living per hectare of gross cropped area increases almost progressively with increase in the level of Gini coefficients (columns 12 and 13).
- At the same time, the number of male or female agricultural labourers per hectare of gross cropped area increases almost progressively with the increasing level of inequality in land ownership (columns 15-16). In short, there has been more crowding of agricultural labourers in areas of high concentration of land ownership.

7. Broad Overview

A detailed examination of different columns of all the four summary tables makes it apparent that, speaking in general, the separate indices of agricultural productivity, growth rates, use of agricultural inputs, foodgrain production, food surplus (or inversely, food deficit), first show a high peak at Gini range of

TABLE IX.4

Summary Table of Average Characteristics of Agricultural Inputs and Labour in 275 Selected Districts Classified According to Levels of Gini Ratio of Land Ownership, India, 1971

Sl. No.	Gini level No. of concentration of land ownership	No. of districts	Average N.P.K. fertilizers per hectare of total gross cropped area (Kg.) (1970-73)	Percent irrigated area to gross cropped area (1970-73)	Mean productivity (per hectare in Rs.) (1962-65 to 1970-73)	Average Agricultural growth rate (1962-65 to 1970-73)	Rural agricultural workers per hectare of total gross cropped area 1971			Rural cultivators per hectare of total gross cropped area, 1971			Rural agricultural labourers per hectare of total gross cropped area, 1971		
							P	M	F	P	M	F	P	M	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	0.360-0.385	5	32.1	50.38	1351	4.16	0.57	0.52	0.05	0.40	0.38	0.02	0.17	0.14	0.03
2.	0.386-0.411	4	16.6	7.69	667	0.57	0.48	0.41	0.07	0.36	0.32	0.04	0.12	0.09	0.03
3.	0.412-0.437	9	9.0	9.87	607	-2.07	0.69	0.54	0.15	0.41	0.35	0.06	0.28	0.19	0.09
4.	0.438-0.463	12	8.5	12.57	877	-0.59	0.77	0.63	0.14	0.45	0.41	0.04	0.32	0.22	0.10
5.	0.464-0.489	32	14.8	19.63	1058	0.83	0.84	0.68	0.16	0.48	0.44	0.04	0.36	0.24	0.12
6.	0.490-0.515	38	18.9	33.07	1007	2.51	0.76	0.65	0.11	0.52	0.48	0.04	0.24	0.17	0.07
7.	0.516-0.541	41	18.6	32.03	934	2.47	0.76	0.65	0.11	0.51	0.47	0.04	0.25	0.18	0.07
8.	0.542-0.567	45	20.3	32.70	1037	2.32	0.96	0.82	0.14	0.66	0.61	0.05	0.30	0.21	0.09
9.	0.568-0.593	36	29.0	39.65	1128	1.52	1.22	0.92	0.30	0.68	0.59	0.09	0.54	0.33	0.21
10.	0.594-0.619	27	20.0	33.43	1116	1.45	1.19	0.90	0.29	0.70	0.60	0.10	0.49	0.30	0.19
11.	0.620-0.645	16	18.6	26.16	1038	1.24	1.47	1.16	0.31	0.82	0.72	0.10	0.65	0.44	0.21
12.	0.646-0.671	10	11.0	20.09	969	0.49	1.39	1.03	0.36	0.82	0.65	0.17	0.57	0.38	0.19
Total for 275 districts		275	19.2	29.55	1017	1.61	0.94	0.76	0.18	0.58	0.52	0.06	0.36	0.24	0.12

0.360 to 0.385, then go down sharply in the Gini ranges between 0.386 and 0.411, gradually take an upward turn thereafter and improve the production performances until the Gini level reaches roughly around 0.567, thus indicating a positive relationship between Gini concentration ratios and agricultural production performances. Thereafter, finally, the indices decrease linearly as the Gini ratio increases to the level of 0.671, thereby indicating a negative relationship between the Gini concentration ratios and the indices of agricultural growth and development.

If we are at all permitted to make the first approximate generalization on the basis of howsoever crude data that we may have, the overall pattern of relationship (of course with minor fluctuations) between the index of land inequality on the one hand and various indices of agricultural growth and production performances on the other is as follows.

It is important again to mention that the number of districts in each Gini level and population in each group is so disparate that no opinion can be asserted with any vehemence. To compensate this to a certain extent, we have presented the various indices of agricultural production performances in terms of per hectare of gross cropped area so as to make them more

or less comparable (as in Tables IX.3 and IX.4) and have also shown the amount of per capita food surplus and per capita food deficit that are occurring in respective Gini ranges (Table IX.3, columns 13 and 14). In spite of that, the effects of population distribution and of many hidden socio-economic factors on the agricultural set-up warn against any conclusive statement.

Keeping all these reservations in mind, one is still left wondering why all the four summary tables and various columns shown therein, which are presented with respect to twelve Gini levels, do indicate some kind of patterns that can be generally divided into four major segments.

A. Between Gini level 0.360 and 0.385

This segment is almost always showing the highest agricultural productivity, the highest agricultural growth rate, the highest use of chemical fertilizer and irrigation, and the highest amount of food surplus per hectare of gross cropped area. In short, this segment indicates a general inverse relationship between Gini ratios and all the separate indices of agricultural performances (including amount

of food surplus). In other words, this group of districts (that includes Bhatinda, Meerut, Purulia, Rajkot and Jamnagar) does support the contention that the lower the degree of land inequality the higher is the level of agricultural productivity, agricultural growth rate and amount of food surplus.

B. Between Gini ratios 0.386 and 0.489

This segment of the Gini distribution is almost always characterized by, first, a sudden drop or fall in various agricultural performances and, then, a gradual improvement in the performance as the Gini level rises. In other words, this segment shows a positive relationship between the index of land inequality and indices of agricultural production performances, which is contrary to the overall general pattern that appears from various columns of Tables IX.1 to IX.4. At the present state of our knowledge, it is not clearly known why such positive relationship between the two should occur especially when the first group of districts in category A records a clear negative relationship.

The crucial question is whether an increasing amount of land inequality does really contribute to augment agricultural growth and development in India. The protagonists of polarisation and concentration of land ownership in the hands of a few proprietors may find comfort in the findings of this segment of Gini distribution. But a final decisive conclusion can be reached for this segment as well as for other segments only after penetrating investigation has been made regarding those factors that are still unidentified, which may be of socio-economic, climatic, physical, cultural or political nature. The 34 districts that queer this pitch deserve to be studied in depth, especially with respect to their unfavourable crop-soil-rainfall-terrain characteristics and their adverse effects on agricultural productivity and other agricultural performance (like food surplus or deficit).

C. Between Gini level 0.490 and 0.593

This segment of the Gini distribution or the group of districts falling in this segment indicates a more or less general and somewhat steady positive relationship between Gini concentration ratio and some of the indices of agricultural growth and development. However, these general patterns are countered by certain indices of agricultural production performances; for instance, agricultural growth rate (Table IX.1, column 6) records a negative relationship as the Gini ratio increases. Agricultural productivity per hectare of gross cropped area (Table IX.1, column 7)

shows a declining trend up to 0.541 Gini level, then it rises as the Gini ratio increases up to 0.593 level. Thereafter, it begins to fall. Amount of food surplus per hectare of gross cropped area also shows a steady positive increase as the Gini level increases up to 0.541, thereafter it records a steady decline (Table IX.3, column 9).

In so far as the use of agricultural inputs is concerned, for instance, chemical fertilizers and irrigation per hectare of gross cropped area (Table IX.4, columns 4 and 5), these indices record a positive relationship with increasing land inequality, but only up to the 0.593 level. Thereafter, they clearly show a downward trend and a definite negative relationship with the increasing magnitude of land inequality. In short, this reversal in the general positive and rising trend is achieved at different Gini levels for different indices of agricultural productivity, growth and performances, be it at 0.541 or 0.567 or 0.593. But downward trends or negative relationships are clearly visible in all the performances as soon as the degree of land inequality crosses the hump of roughly 0.593. So, this seems to be the dividing range that appears from our analysis of land inequality studied in relation to food production, food surplus, food deficit and agricultural growth. Beyond this 0.593 Gini level, both agricultural performance and social equity seem to be in jeopardy.

D. Between Gini ranges 0.594 and 0.671

This segment of the Gini distribution or the cluster of 53 districts belonging to it indicates a general and steady inverse relationship between agricultural production performance and the measure of land inequality, with small curvilinear patterns within that segment. This general trend of this segment of distribution, almost always, suggests that higher degrees of inequality militate against agricultural growth and development and social justice.

These facts can be visually examined by a set of six illustrations drawn (charts 3 to 8) graphically to represent the distribution of six or seven agricultural indices shown in relation to the measure of land inequality for those fiftythree districts which belong to the highest Gini concentration ratios of land ownership (0.594 to 0.671). Data scores for each of the fiftythree districts are plotted separately, instead of three separate groups as in tables. The outcomes are six charts which indicate:

1. Distribution of agricultural productivity (in rupees) per hectare shown in relation to land inequality (chart 3).
2. Distribution of agricultural growth rates in

relation to land inequality (chart 4).

3. Distribution of area irrigated as proportion of the total gross cropped area in relation to land inequality (chart 5).
4. Distribution of chemical fertilizers (in kg.) per hectare of gross cropped area in relation to land inequality (chart 6).
5. Distribution of total foodgrain production per hectare of gross cropped area of nine food crops in relation to land inequality (chart 7).
6. Distribution of food surplus and food deficit (in kg.) per hectare of gross cropped area of nine food crops in relation to land inequality (chart 8).

In each chart, the trend pattern of each respective bivariate distribution, of course, shows many minor troughs and peak, but the overall trend indicates a declining tendency as the Gini concentration ratio increases. This 'general' trend, if we can at all talk in such terms, is shown by a thick freehand line or curve passing through the distribution. This thick line or curve is not a regression line, but rather a schematic line drawn more or less through the middle of the scatter diagram. Such lines simply serve the purpose of underlining the declining trend that repeatedly appears from different charts. A remarkable similarity in the appearances of trend patterns is noticeable from all the charts (except probably in the case of food deficit) which is suggestive of a general inverse relationship between the various indices of agricultural growth and development and the measure of land inequality.

This analysis, with all the limitations of the data, suggests that high inequality in land ownership, above a threshold level of 0.593, impedes agricultural productivity and agricultural growth rates. This does not uphold the contention of those who hold that the key to productivity, assured high growth rate, and food surpluses—even under present conditions of heavy population pressure on arable land and of a situation where the marginal productivity of agricultural labour has by no means been proved to have gone below zero—lies, as Gunnar Myrdal once suggested, only in large scale farming under modern management techniques. Labour productivity seems to improve with smaller holdings and so does management. Since the use of modern inputs and techniques is by no means universal (wooden ploughs and animal power put to the plough without even a technologically efficient yoke being still almost universal) the case of substitutability of labour by capital in this country is still far from being proven. On the other hand, there are indications that more equality in land ownership aids per hectare productivity as well as

agricultural growth rates. These findings are of importance for policy intervention. If properly implemented, land reform policy based on more equitable distribution, even if the ceiling has to be reduced, can ensure augmented agricultural production as well as accelerated agricultural growth rate for the entire country.

The observations arising out of this analysis are even more of a forceful argument in favour of a far more equitable and accessible distribution of agricultural inputs like irrigation, fertilizer, pesticides, pumps, implements, seeds, etc. The present pattern of concentration by means of which these inputs are available only to a few pockets of the country and within them only to the bigger and more richly endowed ownership holdings will not be able to sustain for very long even the current rates of productivity and agricultural growth.

Even granted that the results obtained are fortuitous, they are certainly intriguing. We have presented them in the hope that more work will be done in this direction.

8. Further Research Work Needed

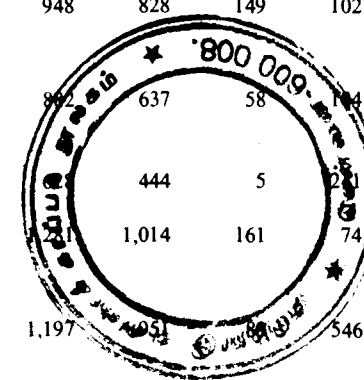
The above exercise did not reveal a clear-cut picture of the interrelationships for the entire 275 districts studied. As a next step we arranged the six natural regions and about 19 major sub-regions of India* by ascending order of Gini ratios and identified, as far as possible, contiguous clusters and isolated districts within stated Gini ranges. The details of the agricultural production performances of the groups of districts falling into respective Gini ranges in the context of the major natural sub-regions are provided in Appendix VI. Table IX.5 summarises the main characteristics.

From this if we care to trace them on the map of India we can notice a large number of geographically contiguous clusters of districts having the same Gini ranges which means Gini ratios may have some relationship with the natural regions and sub-regions or crop-soil-rainfall zones and may be a function of specific socio-economic-cultural situations in well-demarcated natural regions. Grouped in this way, as in Table IX.5, the data unravel another dimension of the complexity. Let us, for instance, look at two sub-regions, Uttar Pradesh Plains and Punjab Plains. Although their Gini ranges are almost the same, their comparative levels of agricultural productivity and growth rates are vastly different (Rs. 1,119 and 2.50 for Uttar Pradesh, and Rs. 1,532 and 7.50 for

*As delineated in *Levels of Regional Development* 1961 (Census of India, Volume I Part I A(i) & (ii) by A. Mitra.)

TABLE IX.5
Summary Table of Agricultural Production Performance in Natural Regions and Sub-regions

Sl. No.	Region/ Sub-Region	Gini level	No. of districts	Main foodgrain crops	Average agricultural growth rate (1962-65 to 1970-73)	Mean productivity (per hectare in Rs.)	Average food production (per hectare of gross cropped area of nine food crops in Kg.)	Average food surplus (per hectare of gross cropped area of nine food crops in Kg.)	Average food deficit (per hectare of gross cropped area of nine food crops in Kg.)	Net food surplus/deficit (per hectare of gross cropped area of nine food crops in Kg.)	Average NPK fertilizer (per hectare of total gross cropped area of all crops in Kg.)	Per cent irrigated area to gross cropped area of all crops.
1	2	3	4	5	6	7	8	9	10	11	12	13
	INDIA	0.360-0.671	275	Rice, Wheat & Bajra	1.61	1,017	918	246	107	139	19.2	29.54
1	Himalayas	0.464-0.619	4	Rice & Wheat	5.27	1,302	1,235	338	32	303	19.8	43.08
1.1	West Himalayas	0.464-0.619	4	Rice & Wheat	5.27	1,302	1,235	335	32	303	19.8	43.08
2	Northern Plains	0.360-0.671	97	Rice & Wheat	3.22	1,166	1,071	350	68	282	21.3	40.77
2.1	Rajasthan Plains	0.386-0.619	9	Jowar & Bajra	3.86	283	376	164	24	140	2.9	16.58
2.2	Punjab Plains	0.360-0.645	17	Wheat	7.00	1,532	1,689	1,128	—	1,128	40.2	76.35
2.3	U.P. Plains	0.360-0.645	41	Wheat & Rice	2.50	1,119	986	203	32	171	26.1	46.41
2.4	Bihar Plains	0.542-0.671	9	Rice	0.99	1,029	953	26	224	-198	14.1	33.05
2.5	West Bengal Plains & Uplands	0.360-0.619	14	Rice	2.46	1,466	1,248	302	150	152	12.1	16.54
2.6	Assam Valley	0.490-0.671	7	Rice	2.01	263	1,002	22	77	-55	3.4	9.99
3	Central Hills & Plateaus	0.386-0.671	78	Rice, Wheat & Jowar	1.59	719	780	262	24	238	7.0	15.68
3.1	Central Hills and plateaus of MP., Rajasthan & U.P.	0.438-0.671	65	Wheat, Rice & Jowar	2.03	673	768	291	4	287	7.1	16.06
3.2	Central Hills and Plateaus of Bihar and Orissa	0.386-0.671	13	Rice	-0.61	948	828	149	102	47	6.5	14.04
4	The Deccan	0.412-0.645	54	Jowar, Rice & Ragi	-1.24	802	637	58	104	-126	18.9	18.90
4.1	Maharashtra & Andhra Deccan	0.412-0.645	33	Jowar	-3.29	802	444	5	25	-236	14.7	15.16
4.2	Karnataka & Tamil Nadu Deccan	0.464-0.593	21	Rice, Ragi & Jowar	2.00	721	1,014	161	74	87	27.0	26.04
5	West Coast Plains	0.360-0.671	28	Rice, Jowar, Ragi & Bajra	1.09	1,197	951	546	—	457	27.2	21.71
5.1	Kutch and Kathiawar	0.360-0.515	9	Bajra & Jowar	2.90	784	694	138	82	56	17.6	17.34
5.2	Gujarat Plains & Dangs	0.412-0.619	8	Jowar, Rice, Maize, Bajra & Ragi	-0.39	1,070	919	64	478	-414	26.9	19.41



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TABLE IX.5 (Concl'd.)

Sl. No.	Region/ Sub-Region	Gini Level	No. of districts	Main foodgrain crops	Average agricultural growth rate (1962-65 to 1970-73)	Mean productivity (per hectare in Rs.)	Average food production (per hectare of gross cropped area of nine food crops in Kg.)	Average food surplus (per hectare of gross cropped area of nine food crops in Kg.)	Average food deficit (per hectare of gross cropped area of nine food crops in Kg.)	Net food surplus/deficit (per hectare of gross cropped area of nine food crops in Kg.)	Average NPK fertilizer (per hectare of total gross cropped area of all crops in Kg.)	Per cent irrigated area to gross cropped area of all crops.
1	2	3	4	5	6	7	8	9	10	11	12	13
5.3	Konkan Coastal Low land	0.620-0.671	3	Rice	-0.29	1,357	1,217	45	465	-420	32.2	4.86
5.4	Konkan Kerala Transition	0.516-0.645	2	Rice	-0.66	1,674	1,352	177	306	-189	46.8	45.52
5.5	Kerala Coastal Plain	0.464-0.645	6	Rice	1.61	1,746	1,519	—	2,184	-2,184	71.0	54.58
6	East Cost Plains	0.438-0.645	14	Rice	1.57	1,719	1,288	252	48	204	41.0	58.83
6.1	Tamil Nadu Coastal Plains	0.464-0.645	7	Rice	3.04	1,910	1,666	474	44	430	56.0	67.84
6.2	Andhra Coastal Plains	0.568-0.619	5	Rice	0.35	1,744	1,171	165	71	94	40.0	57.49
6.3	Orissa Coast	0.438-0.515	2	Rice	-0.53	984	842	29	7	22	11.3	43.17

Punjab, respectively). The reasons may lie in the functioning of institutions by means of which large amounts of fertilizers are available to Punjab Plains (40 kg. per hectare) as compared to that of Uttar Pradesh Plains (26 kg.); as also in the extent of area irrigated (70 per cent in Punjab as against 40 per cent in Uttar Pradesh Plains). Similar differences also exist between Bihar and Bengal Plains and between Maharashtra subregion and Karnataka-Tamil Nadu subregion. Thus, in spite of the fact that the degree of land inequality remains about the same in the groups of sub-regions, there are considerable differences in their magnitude of agricultural production performance, more importantly because of differences in the efficiency and access to institutional facilities and inequitous distribution of agricultural inputs available to the territories, e.g., irrigation facilities, chemical fertilizers, and probably credits extended to farmers. In a word, inequity, no matter in what form, almost always breeds less productivity and more insecurity.

Lack of time and resources did not permit us at present to continue further analyses with such natural regions and sub-regions and to explore further any

likely inter-relationships between the measure of land inequality and the indices of agricultural growth and amount of food surplus and food deficit occurring in each region. The policy implications of these crucial questions could hardly be over-emphasized. Appendix VI and the summary Table IX.5 are, therefore, presented here merely to suggest the direction in which further research may be needed. The message that stems from our present analyses is that when fine-grained data at district or still smaller levels are collected and re-organised with reference to a large number of smaller units of homogeneous crop-soil-rainfall zones (in the context of natural regions and sub-regions, within which various social-economic-cultural-institutional forces influencing both the pattern of land inequality and the pattern of agricultural production performances are also likely to be homogeneous), only then can clear-cut inter-relationships possibly emerge between the pattern of inequality in the land distribution and indices of agricultural growth and development. Any conclusive inference regarding such interrelationships, either positive or negative, must await further detailed generation of data and investigation.

Summary and Conclusions

This monograph has attempted a districtwise delineation of the relationship between India's population growth, food demands and supplies, extent of malnutrition and deprivation, land inequality, and indices of agricultural development. It has also discussed a number of policy questions arising out of the result. The following main observations can be deduced from this investigation:

1. India's population has been rapidly increasing. In the year 2001 it will be close to 950 million. This spurt in growth will bear directly on all aspects of agricultural growth, productivity, food surplus and food deficit.
2. In 1971, food surplus occurred in India in 180 districts out of a total of 281 districts studied. Food deficit occurred in 101 districts. Food surplus mainly occurred in Punjab and Harayana. Food deficit mainly occurred in Maharashtra, Kerala and Uttar Pradesh.
3. Total food surplus in India in 1971 was about 25.03 million tonnes and food deficit was about 11.58 million tonnes, thus creating a net surplus of roughly 13.45 million tonnes. This was, however, mainly due to favourable rainfall during the triennium, 1970-73. At times of variable and scarce rainfall, the position may not be that bright.
4. Food surplus occurs mainly due to higher agricultural growth rate (explaining 28 per cent) and the extent and proportion of area irrigated (explaining another 56 per cent). Chemical fertilizer or Gini concentration ratio of land ownership does not emerge as statistically significant determining factor.
5. Food surpluses even now occur more as a result of greater human effort, natural endowments like fertile soil, light rainfall, better terrain, etc., than on account of fertilizers and other modern inputs.
6. If areas of scarce rainfall are irrigated, food deficits are likely to lessen. On the other hand, growth rates still seem to depend more on human effort and other natural endowments than on greater inputs.
7. Agricultural growth rates have been occurring

mainly in those districts where comparatively little agricultural inputs have gone in. Human effort (through multiple cropping and other means) appears more responsible for growth and production. So, in order to raise food surplus, which depends so much on agricultural growth rates, as our study shows, more effort should go to intensive cultivation and multiple cropping and perhaps to more non-seasonal and non-traditional crops.

8. Agricultural foodgrain production even now depends more upon irrigation (explaining 65 per cent) than on fertilizer. In order to enhance food surplus and reduce food deficit, we shall have to emphasize more on irrigation than on other inputs.
9. High agricultural productivity, on the other hand, depends more upon fertilizers (accounting 30 per cent) than on irrigation. But, of course, irrigation facilities are at the bottom of higher fertilizer use.
10. Agricultural investments, inputs and growth efforts are heavily concentrated in 57 high productivity districts to the neglect of the remaining 225 districts. They are particularly low in 149 very low productivity districts. This tendency has to be arrested in favour of a more equitable distribution of agricultural investments and growth efforts. Inputs have so far gone heavily only to certain privileged areas and zones.
11. Because of these circumstances, initial analysis of Gini co-efficients of concentration of land ownership does not show clear effects. That is, on account of these endowments, high productivity has been occurring in certain zones (66 districts) in spite of high land inequality. On the other hand, low level productivity has been occurring in 147 districts in spite of relatively less land inequality. In these 147 districts, agricultural involution has been taking place; that is, more people are compelled to crowd into districts which do not receive investments by way of inputs, leading to greater fragmentation of holdings.

12. The patterns of migration and urbanization in these 282 districts also confirm this phenomenon of agricultural involution. That is, more crowding in lower order agricultural productivity districts and accelerated polarisation of growth and investment efforts in districts of higher order productivity. High order productivity districts usurp more growth investments but absorb less and less migrants and workers. On the other hand, lower order productivity districts (147) are grossly neglected, but contribute more to the nation's reserve of food surplus and also absorb more migrants and workers.
13. Average use of chemical fertilizers progressively increases with the generation of food surpluses in 180 food surplus districts. Conversely, use of chemical fertilizer is inversely related to the magnitude of food deficit in 101 food deficit districts.
14. The magnitude of food surplus increases progressively with the extent of irrigated area. Conversely, the amount of food deficit progressively decreases with the rise in irrigated area.
15. We do not have enough knowledge of what feature of agricultural productivity and growth rate can be explained by Gini concentration ratios. Our attempts to probe into this unknown domain have also been thwarted by the lack of the right kind of data on land holdings and their ownership patterns. So, no firm conclusion can be put forward. It is especially so when there appears to be irregular curvilinear fluctuations which are suggestive of operation of many factors not properly identifiable: social, cultural, economic or institutional.
16. In spite of these limitations, the analysis of the distribution of Gini concentration ratios in relation to other population and agricultural characteristics reveals some intriguing findings.
17. In general, almost all the different indices of agricultural production performance first show a high peak at the lowest Gini ranges (0.360 to 0.385), then record a sudden steep fall in the performances between the Gini ranges 0.386 and 0.489 (especially due to the presence of 34 less endowed districts), thereafter take an upward turn and improvement in performances until the Gini level reaches roughly around 0.567 or 0.593. Thereafter performance almost linearly decreases as the Gini ratio increases.
18. Although no clear-cut trend emerged for the

entire distribution of data between the Gini ratios on the one hand and any other indices of agricultural performance on the other, either positive or negative, there appears to be a general and steady inverse relationship between the two in all the performances as soon as the degree of land inequality crosses the hump of roughly 0.593

19. Beyond this threshold level, that is, degree of land inequality beyond a certain level of approximately 0.593, there are sufficiently strong tendencies from the data to indicate that a very high degree of land inequality militates against both the agricultural production performances and social equity. In short, equitable land distribution in the shape of land reforms for higher agricultural productivity and growth rate is still very much an issue.
20. Agricultural growth rate is maximum in the group of districts of lowest Gini level and with certain fluctuations declines with the increase in Gini level. That is, where inequality in land ownership is less acute, as in low and middle level of Gini ratios, higher agricultural growth rates occur. On the other hand, higher inequality leads to fall in agricultural growth rates.
21. Amount of food surplus per hectare of gross cropped area is maximum in the districts of lowest land inequality and, with certain troughs and peaks in the distribution, decreases as one goes up the scale of land inequality. Conversely, the amount of food deficit per hectare of gross cropped area does not indicate any conclusive trend.
22. A great deal of penetrating research is urgently required to shed light on the crucial questions of interrelationships between the measure of land inequality and indices of agricultural growth and development in India. In this respect, as the present exercises show, a collection of fine-grained data and their reorganization and analysis with reference to smaller units of homogeneous natural regions and sub-regions may turn out to be rewarding.

It is necessary to reiterate at this point the tentative nature of the above conclusions. This exercise is a *tour de face* in a hitherto untrodden field undertaken primarily to test whether what data are available can be used to delineate small and large regions or for planning for small areas. The main purpose of this monograph has been to draw pointed attention to the need not only of better data but of better methodological approaches in this rather important area of

national concern. Few will question the relevance of the issues raised in this exercise and the present authors will feel suitably rewarded if the questions raised receive the follow-up they deserve.

The application of the Gini coefficient was resorted to with some trepidation. A great many of the Lorenz curves presented in this exercise, when put together on the same sheet, intersected one another and therefore lost much of their interpretability. In the Indian situation it is perhaps the variability of the middle class ranges of land ownership or operational holdings that make more real differences in most respects than the overall Gini coefficients which do not reflect these differences. We debated whether the quotient of the top decile of land holdings divided by the bottom decile would not yield a better index, even as we debated on the possibility of adopting the relative mean deviation, the Gini coefficient and the standard deviation of logarithms¹. We finally decided

on the Gini coefficient as the more familiar tool although we do not by any means feel confident that it is the right answer to some of the conundrums that this monograph has uncovered.

Writing his 'Documentary of Revolution in a Chinese Village', called *Fanshen* (1966), William Hinton observed: "Land reform is on the agenda of mankind". Land reform has been on the agenda of India for a long time and has been held as a stubborn belief by all political persuasions. But Appendix VII of this book will show the extent of concentration of land owned in each of the six levels of agricultural productivity per hectare considered in this monograph. The following abstract of Appendix VII shows the cumulative proportion of number of holdings—(1) up to 2.0–3.0 and (2) 5 to 10 hectares of land vis-à-vis the cumulative proportion of area owned in parcels—(1) up to 2.0 to 3.0 and (2) 5 to 10 hectares of land.

Cumulative Percentage of Holdings (1) up to 2.0 to 3.0 Hectares and (2) 5 to 10 Hectares Related to Cumulative Percentage of Area Owned (1) up to 2.0 to 3.0 Hectares and (2) 5 to 10 Hectares by Each of the Six Levels of Agricultural Productivity

Level of Productivity	Cumulative Percentage of Holdings		Cumulative Percentage of Area Owned	
	Up to 2.0 to 3.0 hectares	5 to 10 hectares	Up to 2.0 to 3.0 hectares	5 to 10 hectares
1 Rs. 1600 and above per hectare	86.27	98.56	29.91	75.59
2 Rs. 1400–1600 per hectare	91.07	99.29	58.33	88.07
3 Rs. 1200–1400 per hectare	85.92	98.60	27.27	73.80
4 Rs. 974–1200 per hectare	86.57	98.44	30.99	72.22
5 Rs. 600–974 per hectare	74.22	95.14	20.19	64.75
6 Less than Rs. 600 per hectare	47.18	84.52	14.37	54.67

Source: *Agricultural Census of India, 1971*; All-India and States.

Advocates of income distribution plead for an income concentration ratio of .25 as an acceptable index for ensuring reasonable distribution of per capita civilization and quality of life. If anything like this index is to be achieved in the distribution of land among cultivators and tillers through the process of land reforms, then clearly a ceiling of 15 acres or 6 hectares of wet land is not going to deliver the goods. Such a ceiling will merely bring about more equity among those who already are the Happy Few (i.e. only among 15.48 to 0.71 per cent of land owing households commanding between 45.33 to 11.93 per

cent of all land owned) and will be of no substantial avail to 84.52 to 99.29 per cent of all land owning households, although these alarming proportions will certainly fall to more acceptable ratios. Such a reform will scratch no more than the surface of the problem. The problem will still continue in much of its original form. Land reform will have meaning of the type envisaged in this study only if the land ceiling per cultivating household is brought down to 2.0 to 3.0 hectares per cultivating household or even less but certainly no higher. But mere redistribution of land will not be enough, although that is a must for

¹Ranadive, K.R. (1965) 'The Equality of Incomes in India'. Bull. Oxford Instt. Econ. Stats. Vol. 27, pp. 119–34.
 Atkinson, A. B. (1970) 'On the Measurement of Inequality', Journal of Economic Theory, Vol. 2, 1970 pp. 244–63; and non-mathematical summary
 Dasgupta Partha, Sen Amartya, Starrett David (1973) 'Notes on the Measurement of Inequality', Journal of

Economic Theory, Vol. 6, 1973, pp. 180–87
 Sen Amartya (1975) On Economic Inequality—O.U.P. Second Indian Impression, 1975
 Rothchild Michael, Stiglitz Joseph E. (1973), Some Further Results on the Measurement of Inequality, Journal of Economic Theory, Vol. 6, 1973, pp. 188–204

establishing an atmosphere of hope and faith, justice and credibility. The first temporary effect of such redistribution will very possibly be a fall in productivity unless it is simultaneously buttressed by legislation preventing alienation and fragmentation, and by positive steps for consolidation, irrigation, particularly at the tail ends of channels, and institutional availability of inputs along with enforcement of productivity and output delivery norms. Effective steps towards corporate and cooperative management in every conceivable way will be inescapable, if land reforms are to be accompanied by concurrent rise in productivity and rate of growth.

These are some of the hurdles that remain to be crossed on the technological, institutional, managerial and agrarian policy side. In finalising its Report in 1976, the National Commission on Agriculture estimated that "the total cereal requirement on the basis of data on improved diets" for 1976, that is, on the assumption that everybody, irrespective of social or economic status or geographical location, would eat his due requirement of cereals, was about 88.8 million tonnes². To this may be added about 12 million tonnes of requirements by way of pulses. The total comes to about 100–101 million tonnes. Allowing for seed, feed, waste, industrial use and for annual increase in population at the rate of 2 per cent and a figure of 0.6 for increase in the annual income elasticity of demand, we find, particularly since 1975, that the demand for cereals is not keeping up with their production³. What is more, there is reason to suspect that the income elasticity of demand may have been appreciably lower than what is desirable so much so that every year since 1975 the difference between the total production and the demand is not really going into consumption but towards a steeply rising buffer stock that the government is being compelled to maintain by way of providing a support price. In the last three years production has not been much of a problem. The real problem has been demand and offtake and unless the demand steadily rises with the growth in population supported in turn by steady increases in the income elasticity of demand, agricultural growth and productivity of the sort envisaged by the National Commission on Agri-

culture and taken note of in section VI above, will be fraught with serious uncertainties. On any showing the Indian cultivator looks competent enough to deliver the goods, provided the inputs are made available to him and the disabilities of the small producer are progressively removed. But will this be adequately matched by continuing and rising demand? It all depends how fast and impressively employment increases which will be one of the surest guarantees of bringing the income elasticity of demand and the price mechanism into fully play⁴. The nation has on its hands an extraordinary situation in which two-fifths of the population go without enough cereals and pulses, while both production and buffer stocks in the hands of government go on increasing. The country should be able to export cereals, but the urgency for that does not seem to exist either, the foreign exchange reserves being again so impressively high and continuing largely unutilized by way of productive investment.

J. N. Sinha has said that in most poor countries land is used now as an instrument of exploitation, of maximisation of personal profits and not of production. In India where production of foodgrains has grown from a mere 50 million tonnes in 1950 to 123 million tonnes in 1977 and where 20 million tonnes are held as buffer stocks, a large proportion of the population still goes hungry. No more than 150 mandays per acre are worked in India compared to 450 in Japan and about 650 in Tachai. Yet with strictly equitable distribution a mere 110 million tonnes would give adequate nutrition to everybody. The buffer stocks of 20 million tonnes are, therefore, in a way fictitious and in another way catastrophic. According to the rates of cereal consumption recommended by the National Institute of Nutrition, 20 million tonnes of foodgrains can keep roughly 40 million of the urban and rural poor—infants, children, women and men—adequately fed for calories for three years together. This can make a major difference between the current picture of starvation and malnutrition in India on the one side and adequate nutrition for the bulk of her deprived population on the other. The food-for-work programme for building up national and community assets can easily be lifted from its below-market, semi-starvation-wages-in-kind to a full-wage-in-kind programme, and put enough of self-respecting purchasing power in the hands of those who are at present unemployed. This can in its turn have a wholesome

² Report of the National Commission on Agriculture, 1976, Part II, Policy and Strategy, Chapter 9, pp. 147, 192–4.

³ The following figures in million tonnes of foodgrains and pulses production are taken from the Government of India's *Economic Survey, 1977–78*, 1978, p. 62, Table 1.6.

	1974–75	1975–76	1976–77	1977–78
All foodgrains	89.81	108.00	100.36	125
Pulses	10.01	13.04	11.21	

⁴ In the fifties the expectation usually held was that the income elasticity of demand would reach 0.8 to 0.9. It is usual now to take 0.6 as more realistic. The other question of the extent of increase in real income, particularly since 1965–66, is far from being settled.

impact on the demand for wage goods, the lack of which is responsible for our wobbling industrial growth. Instead, despite the protestations of the Food Corporation of India, much of this buffer grain irretrievably deteriorates in unsatisfactory storage and feeds rodents and unwelcome pests instead of human beings. It is this way that a large spurious buffer stock is a mixed blessing. Another good harvest might as well result in a catastrophe, with agricultural prices crashing, buffer stocks still further rising and rotting, crop acreage shrinking, and yet with almost a constant proportion of the population chronically going hungry.

The above was written in the middle of 1978. The buffer stocks came extremely handy throughout the year 1979 which suffered from extensive drought

and distress. But for the buffer stocks, all other prices would have risen to more alarming proportions than they did. Foodgrains prices did not appreciably rise anywhere, thanks to competent management both at the Centre and in the States. The unfortunate drought has fortunately staved off in 1979 the catastrophic possibilities of a large buffer stock, but the problem of increasing demand to match potential supply has by no means been satisfactorily worked out.

The way to 2000 will be undoubtedly uphill and strenuous. The Indian peasant has demonstrated that he can make it, even if the circumstances are not all that propitious, let alone ideal. It all the more stands to reason, therefore, that given the will and the requisite social and political organisation the targets should be reasonably within reach.

APPENDICES

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APPENDIX I
District Level Data on Population, Agricultural Productivity, Food Surplus, Food Deficit and Other Agricultural Characteristics, India, 1971

Sl. No.	Districts	State	Total Population 1971	Agricultural growth rate 1962-65 to 1970-73	Agricultural productivity per hectare (in Rs.)	Total Food grain production average of 1970-73 (tonnes)	Food Surplus 1971 (tonnes)	Food Deficit 1971 (tonnes)	Gini Coefficient Concentration of land ownership 1971	Average NPK (fertilizers) (1970-73) (tonnes)	Area irrigated in hectares (1970-73)
1	2	3	4	5	6	7	8	9	10	11	12
AGRICULTURAL PRODUCTIVITY LEVEL I (Rs. 1,600 and above)											
1	West Godavari	(AP)	2,374,306	1.53	2,519	668,443	305,803		0.617	28,214	410,686
2	Chittoor	(..)	2,285,536	2.82	1,909	308,764		- 40,898	0.563	8,435	214,922
3	East Godavari	(..)	3,087,262	- 0.85	1,839	498,983	27,499		0.611	20,474	340,378
4	Krishna	(..)	2,493,574	0.61	1,777	555,283	173,881		0.594	29,673	365,068
5	Kheda	(Gujarat)	2,451,387	3.47	1,830	357,578		- 13,336	0.526	22,351	150,600
6	Karnal	(Haryana)	1,981,303	8.30	1,756	1,386,664	1,091,107		0.527	37,059	687,000
7	Mandya	(Karnataka)	1,154,374	1.92	2,278	248,958	73,996		0.514	16,936	102,541
8	Shimoga	"	1,301,485	5.56	1,943	395,972	198,420		0.484	8,561	165,530
9	Coorg	"	378,291	- 0.36	1,963	83,908	26,422		0.579	3,328	12,820
10	South Kanara	"	1,939,315	- 1.06	1,648	216,027		- 76,529	0.541	10,700	94,870
11	North Kanara	"	849,105	- 0.26	1,699	122,124	29,320		0.620	1,279	21,674
12	Kozhikode	(Kerala)	10,116,265	2.78	1,814	763,367		- 780,538	0.585	36,672	278,508
	+ Malappuram	}									
	+ Palghat										
	+ Ernakulam										
	+ Kottayam										
13	Alleppey	"	2,125,722	2.35	2,071	150,901		- 173,188	0.512	9,303	50,208
14	Quilon	"	2,412,821	1.23	1,667	74,636		- 293,676	0.476	4,946	29,769
15	Trichur	"	2,128,797	1.49	1,640	163,333		- 160,474	0.566	6,104	65,529
16	Trivandrum	"	2,198,606	0.92	1,772	60,405		- 275,109	0.486	4,398	22,768
17	Kolhapur	(Maharashtra)	2,048,049	1.26	2,272	168,955		- 143,194	0.600	14,414	61,933
18	Ludhiana	(Punjab)	1,419,421	7.98	2,125	974,232	756,625		0.503	41,359	425,267
19	Amritsar	"	1,835,500	7.98	1,934	851,332	570,090		0.506	32,816	556,000
20	Kapurthala	"	429,514	9.34	1,921	236,331	170,639		0.558	10,394	128,033
21	Jullundur	"	1,454,501	7.46	1,856	632,698	410,163		0.560	29,614	343,000
22	Ferozpur	"	1,905,833	7.14	1,839	1,279,664	987,871		0.555	43,840	904,433
23	Gurdaspur	"	1,229,249	8.97	1,734	492,664	304,666		0.574	18,213	208,267
24	Sangrur	"	1,146,650	7.37	1,724	918,897	743,047		0.498	25,132	550,567
25	Patiala	"	1,215,100	8.77	1,717	746,531	560,254		0.516	25,941	404,866
26	Bhatinda	"	1,318,134	6.87	1,621	832,364	630,377		0.360	24,295	666,300
27	Coimbatore	(Tamil Nadu)	4,373,178	0.33	1,796	416,742	447		0.531	45,823	349,403
28	Kanyakumari	"	1,222,549	4.06	2,796	151,929		- 37,638	0.480	5,894	64,539
29	South Arcot	"	3,617,723	5.01	2,163	848,080	287,040		0.542	39,524	419,504
30	Chingleput	"	2,907,599	3.39	1,883	606,804	155,444		0.584	31,141	329,567
31	Madurai	"	3,938,197	1.97	1,722	542,927		- 67,301	0.564	23,264	268,296
32	Thanjavur	"	3,840,732	4.64	2,371	1,383,168	788,280		0.584	44,931	664,202
33	North Arcot	"	3,755,797	1.31	1,993	591,093	8,692		0.488	24,006	374,820
34	Muzaffarnagar	(U.P.)	1,802,289	5.52	2,540	350,644	75,189		0.577	22,947	351,571
35	Meerut	"	3,366,953	4.78	2,166	568,719	54,146		0.373	31,096	537,347
36	Bijnor	"	1,490,185	4.43	1,792	242,735	15,254		0.567	11,462	142,607
37	Saharanpur	"	2,054,834	3.84	1,762	384,333	80,110		0.621	17,386	270,569
38	Naini Tal	"	790,080	6.53	1,612	246,408	125,432		0.575	12,618	107,901
39	Burdwan	(West Bengal)	3,916,174	2.02	1,802	726,385	131,166		0.473	11,812	274,585
40	Hooghly	"	2,872,116	4.25	1,983	423,914		- 12,378	0.488	12,046	145,608

1	2	3	4	5	6	7	8	9	10	11	12
41	Birbhum	(West Bengal)	1,775,909	4.01	1,745	640,318	371,601		0.442	8,911	183,953
AGRICULTURAL PRODUCTIVITY LEVEL II (Rs. 1,400-1,600)											
42	Srikakulam	(AP)	5,395,367	-0.29	1,467	630,729		-192,678	0.588	12,355	439,478
	+ Visakhapatnam										
43	Cachar	(Assam)	1,713,318	1.27	1,412	237,620		-16,948	0.669	1,228	2,235
44	Sibsagar	"	1,837,389	0.34	1,492	298,751	25,198		0.605	1,369	743
45	Kashmir Valley*	(J & K)	2,823,861	5.44	1,506	466,387	36,601		0.477	4,263	214,814
46	Cannanore	(Kerala)	2,365,164	0.90	1,511	123,323		-237,446	0.622	4,092	56,675
47	Kolar	(Karnataka)	1,516,646	1.14	1,429	223,535		-63,215	0.509	5,870	91,477
48	Greater Bombay	(Maharashtra)	5,970,575	-8.40	1,594	1,833		-920,900	NA	0	200
49	Kolaba	"	1,263,003	0.31	1,528	214,597	23,000		0.632	5,744	5,200
50	Tirunelveli	(Tamil Nadu)	3,200,515	1.38	1,551	476,684		-17,899	0.633	19,654	234,436
51	Tiruchirapalli	"	3,848,816	1.91	1,522	642,436	46,221		0.582	35,622	327,951
52	Bulandshahr	(UP)	2,073,343	4.78	1,456	678,103	361,618		0.484*	16,511	397,772
53	Howrah	(West Bengal)	2,417,286	1.10	1,565	120,368		-248,180	0.460	2,261	11,999
54	Bankura	"	2,031,039	2.07	1,535	526,752	219,271		0.460	6,495	148,523
55	Midnapore	"	5,509,247	2.58	1,426	1,141,474	306,863		0.491	7,852	110,172
56	Murshidabad	"	2,940,204	3.47	1,405	574,455	129,279		0.416	5,445	79,990
AGRICULTURAL PRODUCTIVITY LEVEL III (Rs. 1,200-1,400)											
57	Nizamabad	(AP)	1,313,268	-4.47	1,298	203,424	2,889		0.609	12,652	123,802
58	Lakhimpur	(Assam)	2,122,719	4.29	1,351	281,461		-34,869	0.557	1,302	10
59	Nowgong	"	1,680,895	1.45	1,246	211,578		-38,486	0.505	921	7,725
60	Darrang	"	1,736,188	1.55	1,278	277,214	18,761		0.553	1,091	95,873
61	Patna	(Bihar)	3,556,945	0.92	1,286	459,223		-79,596	0.583	10,190	327,741
62	Saran	"	4,279,253	3.77	1,239	664,887	80,917		0.556	12,581	137,366
63	Junagadh	(Gujarat)	1,656,677	3.11	1,308	172,092		-78,056	0.227	15,317	118,700
64	Vadodara	"	1,980,065	0.03	1,250	123,811		-175,687	0.499	17,977	100,100
65	Ambala	(Haryana)	1,098,405	6.41	1,362	305,665	141,857		0.579	11,182	99,333
66	Rohtak	"	1,785,534	3.71	1,250	690,997	425,020		0.526	6,551	290,333
67	Chikmagalur	(Karnataka)	736,647	3.28	1,390	142,975	31,194		0.551	6,973	34,924
68	Mysore	"	2,077,238	4.00	1,346	390,766	75,633		0.468	13,693	93,586
69	Tumkur	"	1,627,721	4.53	1,235	292,272	45,525		0.549	5,865	78,667
70	Thana	(Maharashtra)	2,281,664	-2.52	1,399	213,122		-135,821	0.647	5,567	5,200
71	Ropar	(Punjab)	545,005	7.00	1,354	185,865	102,346		0.599	6,638	67,767
72	Hoshiarpur	"	1,052,153	7.41	1,268	431,031	270,194		0.641	11,941	142,267
73	Dharmapuri										
	+ Salem	(Tamil Nadu)	4,670,391	1.08	1,281	489,043		-235,403	0.485	21,015	255,130
74	Deoria	(UP)	2,812,350	2.25	1,273	385,464		-41,552	0.577	20,891	210,891
75	Pilibhit	"	752,114	2.96	1,263	191,073	76,103		0.557	6,209	93,343
76	Moradabad	(UP)	2,428,971	3.86	1,229	427,437	56,330		0.544	15,349	284,814
77	Dehradun	"	577,306	3.45	1,227	57,581		-30,954	0.598	1,507	26,869
78	Jalpaiguri	(West Bengal)	1,750,159	2.62	1,371	306,202	40,200		0.597	1,171	4,540
79	Nadia	"	2,230,270	2.17	1,357	361,258	23,432		0.477	5,292	19,349
80	Cooch Behar	"	1,414,183	1.88	1,351	289,155	74,577		0.442	728	8,605
81	24-Parganas	"	8,449,482	-0.08	1,315	704,301		-580,207	0.523	7,796	28,747
82	Purulia	"	1,602,875	2.82	1,311	314,457	71,860		0.366	1,379	22,163
83	West Dinajpur	"	1,859,887	2.39	1,235	548,631	266,505		0.468	1,475	13,558
AGRICULTURAL PRODUCTIVITY LEVEL IV (Rs. 974-1,200)											
84	Guntur	(AP)	8,356,190	0.74	1,120	1,250,571		-26,690	0.593	78,385	871,942
	+ Kurnool										
	+ Nellore										
	+ Ongole										
85	Goalpara	(Assam)	2,225,103	2.71	1,056	308,326		-22,201	0.524	779	51,526

*Baramula, Srinagar, Anantnag, Punch & Rajauri

1	2	3	4	5	6	7	8	9	10	11	12
86	Kamrup	(Assam)	2,854,183	2.44	1,008	384,756		- 40,076	0.496	1,267	74,387
87	Bhagalpur	(Bihar)	2,091,103	2.87	1,141	335,640	68,813		0.658	2,172	143,412
88	Champaran	"	3,543,103	3.19	1,128	577,698	41,615		0.611	12,130	201,245
89	Shahbad	"	3,939,034	2.65	1,125	934,958	339,428		N.A	23,063	699,174
90	Gaya	"	4,457,473	- 0.85	1,058	631,115		- 42,032	0.611	7,430	590,405
91	Singbhum	"	2,437,799	- 0.51	993	325,945		- 42,697	0.633	706	23,782
92	Santal Parganas	"	3,186,908	- 2.39	979	456,248		- 25,308	0.589	2,849	57,902
93	Valsad	(Gujarat)	1,428,742	- 1.63	1,138	122,900		- 92,217	0.590	4,994	40,200
94	Sabarkantha	"	1,187,637	2.48	1,097	242,601	63,517		0.498	7,301	72,700
95	Jind	(Haryana)	639,610	5.17	1,071	321,331	225,941		0.511	3,531	251,666
96	Chitradurga	(Karnataka)	1,397,456	6.91	1,152	343,230	131,200		0.512	13,809	108,684
97	Hassan	"	1,102,370	0.59	1,147	193,578	26,614		0.502	9,489	52,750
98	Bangalore	"	3,365,515	1.16	1,074	316,533		- 194,893	0.514	11,088	78,083
99	Bellary	"	1,122,686	2.40	1,046	258,396	150,979		0.498	17,449	72,202
100	Belgaum	"	2,423,342	0.99	1,027	379,567	12,026		0.549	10,475	107,796
101	Raipur	(MP)	2,613,531	2.19	1,093	770,293	378,153		0.659	14,102	215,726
102	Balaghat	"	977,583	2.04	975	231,619	84,876		0.594	2,190	105,143
103	Ratnagiri	(Maharashtra)	1,990,583	1.34	1,144	196,697		- 102,873	0.664	5,471	14,933
104	Ganjam	(Orissa)	2,293,808	0.42	1,163	391,172	45,040		0.527	9,265	176,934
105	Sambalpur	"	1,844,898	0.51	1,133	517,093	237,850		0.517	13,428	238,919
106	Cuttack + Puri	"	6,168,537	- 0.59	1,077	923,346		- 10,040	0.505	15,905	614,507
107	Dhenkanal	"	1,293,914	0.50	1,070	290,208	235,238		0.481	731	15,996
108	Kalahandi	"	3,207,150	- 0.30	992	667,060	118,731		0.477	1,884	34,350
	+ Koraput										
109	Bolangir	"	1,263,657	- 0.88	985	257,151	66,036		0.495	1,300	82,167
110	Ramanathapuram	(Tamil Nadu)	2,860,207	0.88	1,087	379,807		- 62,187	0.573	12,522	253,333
111	Aligarh	(UP)	2,111,829	6.47	1,198	717,511	394,807		0.539	11,533	393,429
112	Kheri	"	1,486,590	0.54	1,187	264,682	37,394		0.551	8,348	70,742
113	Bareilly	"	1,779,867	1.02	1,129	267,731		- 4,504	0.539	9,449	155,009
114	Rampur	"	901,209	2.00	1,128	219,573	81,875		0.534	9,480	82,302
115	Mathura	"	1,290,307	4.67	1,110	403,899	206,599		0.515	4,727	236,233
116	Etawah	"	1,447,702	3.08	1,082	372,575	151,259		0.533	5,870	185,320
117	Gorakhpur	"	3,038,177	2.69	1,069	457,069		- 5,055	0.573	17,839	238,444
118	Faizabad	"	1,927,281	1.50	1,064	269,179		- 23,909	0.562	14,484	168,801
119	Kanpur	"	2,996,232	2.97	1,063	513,808	55,403		0.553	8,270	179,720
120	Shahjahanpur	"	1,286,104	2.97	1,060	256,824	59,896		0.559	6,155	149,548
121	Etah	"	1,570,925	2.70	1,019	415,710	175,645		0.559	7,866	227,665
122	Hardoi	"	1,849,519	2.85	1,018	394,103	111,347		0.545	4,687	137,597
123	Sitapur	"	1,884,400	0.63	1,011	299,680	11,644		0.531	5,818	104,531
124	Farrukhabad	"	1,556,930	1.33	1,008	346,280	108,150		0.565	13,840	165,891
125	Fatehpur	"	1,278,254	1.88	999	302,924	108,284		0.574	4,030	103,350
126	Bara Banki	"	1,635,593	0.10	997	292,441	42,735		0.524	10,618	132,907
127	Basti	"	2,984,090	2.66	996	522,565	68,230		0.595	18,836	300,547
128	Ballia	"	1,588,935	1.90	990	209,723		- 31,338	0.612	5,543	107,568
129	Jaunpur	"	2,005,434	1.13	981	309,229	5,491		0.576	9,413	175,745
130	Budaun	"	1,645,967	2.14	978	385,233	133,406		0.542	9,070	181,079
131	Azamgarh	"	2,857,484	0.86	975	345,183		- 87,902	0.600	9,897	245,144
132	Malda	(West Bengal)	1,612,657	3.07	1,125	300,718	56,450		0.520	3,090	14,863
AGRICULTURAL PRODUCTIVITY LEVEL V (Rs. 600-974)											
133	Cuddapah	(AP)	1,577,267	- 1.26	856	17,174		- 66,080	0.576	9,731	134,787
134	Anantapur	"	2,115,321	- 1.52	852	24,274		- 81,074	0.581	4,599	150,410
135	Karimnagar	"	1,963,428	- 0.57	813	26,459		- 35,493	0.643	8,641	139,417
136	Warangal	"	1,870,933	0.37	750	252,158		- 34,135	0.624	10,419	126,418
137	Khammam	"	1,369,892	- 0.14	745	190,459		- 19,151	0.572	7,346	68,478
138	Medak	"	1,467,944	- 5.32	640	162,478		- 61,810	0.612	3,308	81,494

1	2	3	4	5	6	7	8	9	10	11	12
139	Nalgonda	(AP)	1,819,738	1.22	623	312,316	33,986		0.576	7,684	212,117
140	Darbhanga	(Bihar)	5,233,904	0.49	955	558,956		- 231,045	0.548	7,172	83,260
141	Muzaffarpur	"	4,840,681		869	435,793		- 294,655	0.625	7,522	51,489
142	Dhanbad	"	4,486,631	- 3.75	813	294,585		- 384,817	0.637	1,145	28,197
	+ Hazaribagh	"									
143	Ranchi	"	2,611,445	1.55	806	390,123		- 4,211	0.613	2,848	25,938
144	Monghyr	"	6,242,877	- 0.39	801	658,615		- 286,045	0.629	15,535	197,558
	+ Saharsa	"									
145	Palamau	"	1,504,350	- 0.27	658	150,879		- 76,388	0.651	508	72,314
146	Purnea	"	3,941,863	- 2.29	786	415,475		- 181,315	0.656	3,256	92,717
147	Bharuch	(Gujarat)	1,109,601	- 0.60	965	90,358		- 77,074	0.476	7,232	55,900
148	Maheana	"	2,092,468	4.76	958	406,036	90,419		0.489	8,423	215,200
149	Surat	"	1,786,924	- 0.89	949	150,955		- 118,722	0.483	9,883	66,600
150	Panch Mahals	"	1,848,804	0.64	942	376,724	97,667		0.435	2,948	26,600
151	Amreli	"	848,730	0.35	878	151,367	23,339		0.402	15,649	50,600
152	Ahmadabad	"	2,910,307	0.85	871	184,120		- 256,859	0.603	8,517	94,000
153	Rajkot	"	1,624,072	1.04	863	151,187		- 93,907	0.383	21,667	113,900
154	Jamnagar	"	1,111,343	5.28	795	118,000		- 49,755	0.366	11,413	69,300
155	Bhavnagar	"	1,405,285	1.61	714	189,760		- 22,337	0.409	12,614	72,000
156	Kutch	"	849,769	4.62	683	103,582		- 24,273	0.447	1,759	65,900
157	The Dangs	"	94,185	- 4.95	611	11,212		- 3,003	0.418	4	100
158	Hisar	(Haryana)	2,132,948	4.16	968	970,499	652,513		0.528	16,521	301,333
159	Gurgaon	"	1,707,369	5.56	937	510,331	255,720		0.544	6,197	164,000
160	Jammu Region	(J&K)	1,687,480	5.67	862	416,337	160,300		0.542	2,665	108,015
161	Raichur	(Karnataka)	1,415,740	6.64	802	365,788	151,433		0.466	12,577	139,675
162	Bidar	"	824,059	- 0.12	719	132,534	7,654		0.494	2,029	14,018
163	Dharwar	"	2,342,213	0.49	699	364,189	8,940		0.479	7,806	70,724
164	Bilaspur	(MP)	2,440,962	2.10	963	618,201	251,858		0.617	8,558	115,349
165	Bastar	"	1,515,956	1.11	847	379,799	152,208		0.585	605	13,248
166	Bhind	"	793,955	3.13	835	268,441	148,271		0.519	2,369	66,175
167	Narsimhapur	"	519,270	1.08	824	155,668	77,444		0.500	1,625	13,229
168	Raigarh	"	1,278,705	0.27	818	257,658	65,781		0.601	2,886	14,891
169	Tikamgarh	"	568,885	3.82	778	149,141	63,234		0.511	4,877	81,151
170	Durg	"	2,461,901	0.88	755	518,088	148,412		0.595	10,034	140,405
171	Gwalior	"	858,005	- 0.85	746	161,593	31,760		0.646	1,968	79,535
172	Morena	"	985,338	3.40	742	260,843	111,729		0.502	4,044	109,670
173	Surguja	"	1,326,439	1.02	741	259,112	59,675		0.555	827	7,309
174	Shajapur	"	678,359	2.29	716	223,773	121,613		0.523	2,171	25,104
175	Indore	"	1,025,150	4.26	714	148,978		- 5,813	0.541	4,187	24,540
176	Mandsaur	"	961,522	2.80	697	263,777	118,914		0.528	6,575	70,725
177	Seoni	"	668,352	1.84	695	155,711	55,323		0.585	487	27,011
178	Mandla	"	873,577	2.51	685	166,346	35,189		0.570	256	2,895
179	Chhatarpur	"	712,385	1.56	677	179,180	71,525		0.562	2,702	67,244
180	Chhindwara	"	989,413	0.11	677	199,114	50,371		0.557	1,533	27,482
181	Ujjain	"	862,516	2.95	668	239,284	109,305		0.519	3,904	20,012
182	Dewas	"	594,336	0.81	662	161,925	72,408		0.541	1,614	14,646
183	Khandwa	"	879,331	0.69	654	168,358	35,951		0.481	5,727	20,973
184	Shahdol	"	1,029,839	2.59	640	196,054	41,140		0.615	512	4,062
185	Khargone	"	1,284,812	- 2.87	613	204,743	11,428		0.455	4,812	40,885
186	Raisen	"	553,026	1.38	610	189,099	105,685		0.505	1,175	8,879
187	Sagar	"	1,062,291	3.33	605	259,067	98,774		0.580	966	16,488
188	Bhandara	(Maharashtra)	1,585,580	- 0.29	809	280,909	39,581		N.A.	6,080	138,200
189	Sangli	"	1,539,820	- 5.21	681	119,863		- 114,948	0.585	7,737	63,600
190	Satara	"	1,727,376	- 2.72	676	164,229		- 98,049	0.584	9,540	97,500
191	Keonjhar	(Orissa)	955,514	- 0.75	934	159,555	14,931		0.392	355	9,492
192	Sundargarh	"	1,030,758	- 0.69	910	169,671	13,391		0.449	449	11,966
193	Balasore	"	1,830,504	- 0.47	891	319,321	42,193		0.459	1,936	67,641

1	2	3	4	5	6	7	8	9	10	11	12
194	Mayurbhanj	(Orissa)	1,434,200	- 1.31	888	265,292	48,316		0.470	746	4,421
195	Baudh Khondmals	"	621,675	- 0.49	854	88,082		- 6,292	N.A.	267	14,000
196	Bharatpur	(Rajasthan)	1,490,206	6.20	906	499,347	274,526		0.505	2,428	152,199
197	Banswara	"	654,586	1.67	857	163,492	65,412		0.550	732	12,881
198	Chittaurgarh	"	944,981	5.68	837	287,519	145,603		0.516	5,783	112,230
199	Alwar	"	1,391,162	7.38	820	452,270	242,900		0.771	3,410	105,706
200	Ganganagar	"	1,394,011	8.54	818	616,590	406,656		0.511	14,095	655,481
201	Udaipur	"	1,803,680	1.63	806	386,641	116,115		0.643	2,014	124,909
202	Bundi	"	449,021	6.09	799	197,751	130,169		0.539	2,984	110,723
203	Dungarpur	"	530,258	0.48	729	112,019	32,701		0.512	192	14,370
204	Sawai Madhopur	"	1,193,528	3.88	696	357,562	177,728		0.574	2,826	103,838
205	Bhilwara	"	1,054,890	3.67	664	240,796	82,218		0.511	2,996	158,512
206	Kota	"	1,142,870	4.44	659	379,253	207,078		0.530	10,110	152,694
207	Jaipur	"	2,482,385	4.71	653	454,281	80,741		0.499	2,715	246,543
208	Mainpuri	(UP)	1,445,534	2.43	967	359,591	138,695		0.561	7,946	224,010
209	Varanasi	"	2,852,459	- 0.84	933	273,926		- 160,237	0.589	14,688	183,495
210	Ghazipur	"	1,531,654	3.55	923	244,572	12,223		0.606	5,921	119,412
211	Unnao	"	1,484,393	4.41	918	342,005	115,841		0.527	4,140	142,307
212	Rae Bareli	"	1,510,812	3.41	911	297,655	68,100		0.521	5,024	159,306
213	Sultanpur	"	1,642,928	1.54	890	278,848	29,530		0.579	8,473	140,052
214	Lucknow	"	1,617,846	1.78	867	137,152		- 109,972	0.515	5,617	71,473
215	Allahabad	"	2,937,278	1.74	857	464,637	17,322		0.619	11,218	154,667
216	Agra	"	2,308,638	2.17	851	353,286	410		0.525	9,544	183,758
217	Pratapgarh	"	1,422,707	0.48	801	205,478		- 9,956	0.549	5,201	105,069
218	Gonda	"	2,302,029	1.28	794	394,361	43,372		0.585	11,700	147,028
219	Mirzapur	"	1,541,088	0.49	768	259,265	24,634		0.666	4,331	105,082
220	Jalaun	"	813,490	1.04	748	272,888	148,737		0.548	3,776	138,337
221	Banda	"	1,182,215	2.77	745	424,301	244,005		0.592	1,616	101,906
222	Hamirpur	"	988,215	3.70	740	383,087	232,437		0.555	1,239	78,202
223	Jhansi	"	1,307,058	2.33	655	337,822	138,489		0.537	2,289	105,717
224	Bahraich	"	1,726,972	1.86	618	347,261	83,471		0.562	5,465	54,823
AGRICULTURAL PRODUCTIVITY LEVEL VI (less than Rs. 600)											
225	Hyderabad	(AP)	2,791,762	- 3.72	491	101,565		- 326,065	0.592	8,871	52,176
226	Adilabad	"	1,288,348	- 0.89	474	178,299		- 18,648	0.563	1,547	32,199
227	Mahbubnagar	"	1,932,082	- 1.82	465	237,664		- 57,517	0.547	7,335	106,724
228	Banas Kantha	(Gujarat)	1,265,383	4.45	560	380,228	189,207		0.436	3,939	130,500
229	Surendranagar	"	845,454	1.54	508	101,111		- 26,515	0.418	3,273	57,000
230	Mahendragarh	(Haryana)	691,639	5.52	548	227,331	124,399		0.510	1,215	50,333
231	Gulbarga	(Karnataka)	1,739,220	- 0.26	448	341,128	77,793		0.481	1,695	21,292
232	Bijapur	"	1,985,591	- 1.65	410	369,957	69,230		0.481	3,145	64,965
233	Betul	(MP)	736,196	- 0.28	598	156,263	45,660		0.560	1,454	33,199
234	Jabalpur	"	1,686,030	1.01	595	251,303		- 2,849	0.611	1,777	26,098
235	Hoshangabad	"	805,870	1.15	593	185,856	64,381		0.550	1,366	14,249
236	Vidisha	"	658,427	1.87	587	268,527	169,123		0.519	447	3,602
237	Shivpuri	"	676,567	- 0.11	581	162,900	60,657		0.509	884	56,960
238	Sehore	"	1,084,933	1.11	581	232,969	69,070		0.475	3,192	25,283
239	Dhar	"	842,400	- 0.61	576	173,446	46,770		0.500	2,358	30,234
240	Damoh	"	573,263	1.93	576	146,430	60,138		0.594	605	15,058
241	Ratlam	"	626,534	0.47	570	115,075	20,763		0.524	4,090	24,803
242	Raigarh	"	644,346	1.55	557	163,229	66,075		0.523	959	22,235
243	Panna	"	429,077	1.96	556	101,219	36,572		0.567	596	10,403
244	Datia	"	255,267	2.35	555	74,058	35,516		0.524	426	15,721
245	Satna	"	913,531	2.88	548	181,937	44,484		0.640	1,916	11,314
246	Rewa	"	977,894	2.71	542	178,641	31,664		0.660	1,869	9,718
247	Guna	"	783,748	2.33	523	257,340	139,027		0.530	639	20,043

1	2	3	4	5	6	7	8	9	10	11	12
248	Sidhi	(MP)	776,786	3.97	485	136,972	20,157		0.637	366	2,782
249	Jhabua	"	667,811	-5.96	441	81,063		-19,328	0.459	260	8,412
250	Chandrapur	(Maharashtra)	1,640,137	-0.67	557	277,628	27,788		0.520	5,883	112,400
251	Nasik	"	2,369,221	-2.75	550	192,597		-168,857	0.491	9,588	108,233
252	Ahmednagar	"	2,269,117	-5.29	543	191,663		-154,235	0.505	15,772	165,967
253	Dhulia	"	1,662,181	-5.02	479	156,730		-96,640	0.437	10,553	72,333
254	Yeotmal	"	1,423,677	-0.56	462	163,298		-53,668	0.441	6,584	10,400
255	Jalgaon	"	2,123,121	-8.41	460	160,197		-163,574	0.484	12,005	100,766
256	Poona	"	3,178,029	-5.04	431	170,197		-314,814	0.560	15,001	130,866
257	Wardha	"	779,562	-0.37	406	92,797		-26,080	0.475	5,793	11,767
258	Nagpur	"	1,942,688	-1.43	392	132,766		-163,893	0.479	7,454	40,033
259	Amravati	"	1,541,209	-5.23	386	117,831		-117,405	0.524	7,037	16,633
260	Buldhana	"	1,262,978	-4.09	375	153,665		-38,883	0.519	7,295	19,467
261	Akola	"	1,501,478	-3.43	362	132,997		-96,058	0.512	6,052	10,733
262	Nanded	"	1,397,762	-5.04	332	117,997		-95,079	0.434	6,454	21,167
263	Osmanabad	"	1,896,687	-7.41	329	168,330		-120,965	0.436	6,121	84,100
264	Sholapur	"	2,253,840	-8.48	301	162,763		-181,207	0.488	9,138	125,533
265	Parbhani	"	1,506,771	-6.28	294	133,431		-96,206	0.428	6,579	24,886
266	Aurangabad	"	1,971,006	-8.29	263	169,864		-130,789	0.438	7,886	91,200
267	Bhir	"	1,286,121	-8.89	249	122,364		-73,707	0.466	7,929	46,800
268	Sirohi	(Rajasthan)	423,815	4.61	597	84,068	20,504		0.572	549	46,907
269	Jhalawar	"	622,001	1.17	553	157,658	64,200		0.534	986	36,823
270	Tonk	"	625,830	1.00	456	221,765	127,683		0.566	611	72,917
271	Jalor	"	667,950	9.58	424	247,276	146,973		0.528	256	73,172
272	Pali	"	970,002	6.76	421	206,486	60,952		0.617	1,029	108,201
273	Ajmer	"	1,147,729	2.63	414	172,733	205		0.636	536	92,735
274	Sikar	"	1,042,648	2.72	349	144,571		-11,779	0.491	414	43,115
275	Jhunjhun	"	929,230	2.92	269	98,350		-41,210	0.479	394	18,799
276	Jodhpur	"	1,152,712	10.76	231	214,115	40,745		0.547	563	33,069
277	Nagaur	"	1,262,157	2.67	223	193,923	4,487		0.471	202	29,453
278	Barmer	"	774,805	7.20	179	273,595	156,988		0.494	92	15,397
279	Churu	"	874,439	1.06	140	94,936		-36,283	0.405	17	499
280	Bikaner	"	573,149	-1.91	62	19,341		-66,854	0.448	19	3,747
281	Jaisalmer	"	166,761	-9.89	52	9,189		-16,009	0.546	39	252
(AP) Andhra Pradesh			(MP) Madhya Pradesh								
(J & K) Jammu and Kashmir			(UP) Uttar Pradesh								

APPENDIX II
District Level Information on Population in 1971
Classified by Selected Age Sex Biological Groups and Arranged According to Levels of
Agricultural Productivity Per Hectare

ACTUAL POPULATION, 1971								
Sl. No.	Districts	State	Adult Males	Adult Females			Children (0-14 years)	Total Population (col. 4 to 8)
				Pregnant	Lactating	Others		
1	2	3	4	5	6	7	8	9

AGRICULTURAL PRODUCTIVITY LEVEL I (Rs. 1,600 and above per hectare)

1	West Godavari	(Andhra Pradesh)	709,561	29,548	42,914	631,051	961,232	2,374,306
2	Chittoor	"	694,842	27,948	40,591	596,888	925,267	2,285,536
3	East Godavari	"	921,623	38,462	55,861	821,444	1,249,372	3,087,262
4	Krishna	"	756,308	30,566	44,394	652,813	1,009,493	2,493,574
5	Kheda	(Gujarat)	732,817	27,837	40,431	594,529	1,055,773	2,451,387
6	Karnal	(Haryana)	576,830	20,516	29,797	438,167	915,993	1,981,303
7	Mandya	(Karnataka)	342,984	13,499	19,606	288,302	489,983	1,154,374
8	Shimoga	"	392,524	14,980	21,757	319,940	552,284	1,301,485
9	Coorg	"	115,379	4,301	6,247	91,868	160,496	378,291
10	South Kanara	"	548,910	23,797	34,562	508,234	823,812	1,939,315
11	North Kanara	"	252,731	9,911	14,394	211,672	360,397	849,105
12	Kozhikode, + Malappuram, + Palghat, + Ernakulam, + Kottayam	(Kerala)	2,973,805	128,892	187,199	2,752,777	4,073,592	10,116,265
13	Alleppey	"	617,950	27,382	39,770	584,821	855,799	2,125,722
14	Quilon	"	710,893	30,672	44,548	655,077	971,631	2,412,821
15	Trichur	"	603,028	28,104	40,818	600,222	856,625	2,128,797
16	Trivandrum	"	645,716	28,038	40,722	598,816	885,314	2,198,606
17	Kolhapur	(Maharashtra)	618,712	24,460	35,526	522,410	846,941	2,048,049
18	Ludhiana	(Punjab)	453,642	15,949	23,163	340,618	586,049	1,419,421
19	Amritsar	"	583,564	20,751	30,138	443,174	757,873	1,835,500
20	Kapurthala	"	134,149	4,956	7,198	105,840	177,371	429,514
21	Jullundur	"	455,803	16,719	24,282	357,064	600,633	1,454,501
22	Ferozpur	"	601,367	21,735	31,568	464,198	786,965	1,905,833
23	Gurdaspur	"	383,731	14,191	20,611	303,083	507,633	1,229,249
24	Sangrur	"	367,685	12,833	18,639	274,078	473,415	1,146,650
25	Patiala	"	388,217	13,658	19,837	291,697	501,691	1,215,100
26	Bhatinda	"	419,414	14,888	21,623	317,959	544,250	1,318,134
27	Coimbatore	(Tamil Nadu)	1,391,312	55,857	81,125	1,192,941	1,651,943	4,373,178
28	Kanyakumari	"	385,878	15,744	22,866	336,248	461,813	1,222,549
29	South Arcot	"	1,143,502	46,521	67,566	993,554	1,366,580	3,617,723
30	Chingleput	"	929,379	36,955	53,673	789,267	1,098,325	2,907,599
31	Madurai	"	1,234,359	51,080	74,188	1,090,924	1,487,646	3,938,197
32	Thanjavur	"	1,198,962	50,019	72,647	1,068,271	1,450,833	3,840,732
33	North Arcot	"	1,186,087	48,341	70,209	1,032,422	1,418,738	3,755,797
34	Muzaffarnagar	(Uttar Pradesh)	570,220	20,066	29,143	428,547	754,313	1,802,289
35	Meerut	"	1,064,890	37,501	54,466	800,925	1,409,171	3,366,953
36	Bijnor	"	465,848	16,829	24,443	359,427	623,639	1,490,185
37	Saharanpur	"	653,619	22,729	33,012	485,433	860,041	2,054,834
38	Naini Tal	"	254,562	8,602	12,493	183,711	330,712	790,080
39	Burdwan	(West Bengal)	1,219,981	42,596	61,866	909,727	1,682,004	3,916,174
40	Hooghly	"	890,140	31,422	45,635	671,055	1,233,864	2,872,116

1	2	3	4	5	6	7	8	9
41 Birbhum	(West Bengal)	530,275	20,221	29,369	431,866	764,178	1,775,909	
Total for Level I		29,121,199	1,149,076	1,668,897	24,541,060	38,524,184	95,004,416	
AGRICULTURAL PRODUCTIVITY LEVEL II (Rs. 1,400-1,600 per hectare)								
42 Srikakulam + Visakhapatnam	(Andhra Pradesh)	1,599,048	67,703	98,332	1,445,957	2,184,327	5,395,367	
43 Cachar	(Assam)	491,100	17,584	25,538	375,539	803,557	1,713,318	
44 Sibsagar	"	537,003	18,456	26,805	394,164	860,961	1,837,389	
45 Kashmir Valley	(Jammu & Kashmir)	889,526	30,382	44,128	648,888	1,210,937	2,823,861	
46 Cannanore	(Kerala)	691,211	30,310	44,021	647,329	952,293	2,365,164	
47 Kolar	"	450,366	17,746	25,774	379,002	643,758	1,516,646	
48 Greater Bombay	(Maharashtra)	2,058,504	60,804	88,311	1,298,602	2,464,354	5,970,575	
49 Kolaba	"	363,530	15,827	22,988	338,030	522,628	1,263,003	
50 Tirunelveli	(Tamil Nadu)	975,805	42,659	61,958	911,083	1,209,010	3,200,515	
51 Tiruchirapalli	"	1,203,013	50,061	72,707	1,069,149	1,453,886	3,848,816	
52 Bulandshahr	(Uttar Pradesh)	647,802	23,430	34,029	500,395	867,687	2,073,343	
53 Howrah	(West Bengal)	774,877	25,432	36,938	543,163	1,036,876	2,417,286	
54 Bankura	"	609,499	23,006	33,414	491,348	873,772	2,031,039	
55 Midnapore	"	1,664,003	61,983	90,022	1,323,770	2,369,469	5,509,247	
56 Murshidabad	"	883,414	33,262	48,309	710,381	1,264,838	2,440,204	
Total for Level II		13,838,701	518,645	753,274	11,076,800	18,718,353	44,905,773	
AGRICULTURAL PRODUCTIVITY LEVEL III (Rs. 1,200-1,400 per hectare)								
57 Nizamabad	(Andhra Pradesh)	391,414	16,384	23,796	349,919	531,675	1,313,268	
58 Lakhimpur	(Assam)	625,975	21,105	30,653	450,750	994,236	2,122,719	
59 Nowgong	"	487,690	17,023	24,723	363,556	787,903	1,680,895	
60 Darrang	"	506,811	17,463	25,363	372,963	813,588	1,736,188	
61 Patna	(Bihar)	1,057,176	41,351	60,057	883,141	1,515,220	3,556,945	
62 Saran	"	1,181,891	53,632	77,894	1,145,428	1,820,408	4,279,253	
63 Junagadh	(Gujarat)	484,481	19,270	27,988	411,559	713,379	1,656,677	
64 Vadodara	"	598,821	22,574	32,787	482,125	852,758	1,980,065	
65 Ambala	(Haryana)	318,888	11,411	16,573	243,712	507,821	1,098,405	
66 Rohtak	"	512,213	18,806	27,314	401,651	825,550	1,785,534	
67 Chikmagalur	(Karnataka)	221,485	8,507	12,355	181,688	312,612	736,647	
68 Mysore	"	623,113	24,048	34,927	513,594	881,556	2,077,238	
69 Tumkur	"	484,475	18,999	27,594	405,775	690,878	1,627,721	
70 Thana	(Maharashtra)	713,034	26,272	38,157	561,090	943,111	2,281,664	
71 Ropar	(Punjab)	173,518	6,151	8,934	131,375	225,027	545,005	
72 Hoshiarpur	"	326,884	12,211	17,736	260,807	434,515	1,052,153	
73 Dharmapuri + Salem	(Tamil Nadu)	1,479,436	59,922	87,030	1,279,785	1,764,218	4,670,391	
74 Deoria	(Uttar Pradesh)	831,803	33,768	49,043	721,181	1,176,555	2,812,350	
75 Pilibhit	"	238,375	8,356	12,136	178,461	314,786	752,114	
76 Moradabad	"	765,861	27,154	39,438	579,941	1,016,577	2,428,971	
77 Dehra Dun	"	188,882	6,163	8,952	131,635	241,674	577,306	
78 Jalpaiguri	(West Bengal)	545,121	19,040	27,653	406,643	751,702	1,750,159	
79 Nadia	"	672,789	25,125	36,491	536,598	959,267	2,220,270	
80 Cooch Behar	"	433,609	15,655	22,738	334,358	607,823	1,414,183	
81 24-Parganas	"	2,637,408	91,700	133,183	1,958,443	3,628,748	8,449,482	
82 Purulia	"	479,802	18,204	26,439	388,783	689,647	1,602,875	
83 West Dinajpur	"	568,760	20,649	29,990	441,004	799,484	1,859,887	
Total for Level III		17,540,795	660,943	959,944	14,115,965	24,800,718	58,078,365	

1	2	3	4	5	6	7	8	9
AGRICULTURAL PRODUCTIVITY LEVEL IV (Rs. 974-1,200 per hectare)								
84 Guntur + Kurnool + Ongole + Nellore	(Andhra Pradesh)	2,516,935	103,165	149,936	2,203,315	3,382,939	8,356,190	
85 Goalpara	(Assam)	636,217	22,897	33,256	489,025	1,043,708	2,225,103	
86 Kamrup	"	832,244	28,744	41,747	613,892	1,337,556	2,854,183	
87 Bhagalpur	(Bihar)	619,003	24,418	35,464	521,501	890,717	2,091,103	
88 Champaran	"	1,039,597	41,771	60,668	892,119	1,508,948	2,543,103	
89 Shahabad	"	1,146,091	46,857	68,054	1,000,733	1,677,299	3,939,034	
90 Gaya	"	1,280,829	53,719	78,021	1,147,295	1,897,609	4,457,473	
91 Singhbhum	"	710,954	28,927	42,014	617,807	1,038,097	2,437,779	
92 Santal Parganas	"	921,704	38,150	55,408	814,770	1,356,786	3,186,908	
93 Valsad	(Gujarat)	405,101	17,160	24,922	366,478	615,081	1,428,742	
94 Sabarkantha	"	342,294	14,028	20,374	299,593	511,348	1,187,637	
95 Jind	(Haryana)	185,748	6,643	9,647	141,865	295,707	639,610	
96 Chitradurga	(Karnataka)	419,702	16,157	23,467	345,078	593,052	1,397,456	
97 Hassan	"	325,245	12,985	18,859	277,317	467,964	1,102,370	
98 Bangalore	"	1,026,495	38,268	55,580	817,292	1,427,880	3,365,515	
99 Bellary	"	332,437	13,175	19,135	281,380	476,559	1,122,686	
100 Belgaum	"	724,981	28,135	40,862	600,878	1,028,486	2,423,342	
101 Raipur	(Madhya Pradesh)	732,560	31,026	45,062	662,636	1,142,247	2,613,531	
102 Balaghat	"	275,338	11,550	16,775	246,669	427,251	977,583	
103 Ratnagiri	(Maharashtra)	524,924	26,925	39,106	575,044	824,584	1,990,583	
104 Ganjam	(Orissa)	648,176	28,306	41,111	604,526	971,689	2,293,808	
105 Sambalpur	"	538,626	22,041	32,012	470,736	781,483	1,844,898	
106 Cuttack + Puri	"	1,795,284	73,932	107,378	1,578,989	2,612,954	6,168,537	
107 Dhenkanal	"	377,617	15,464	22,461	330,282	548,090	1,293,914	
108 Kalahandi + Koraput	"	929,571	38,599	56,062	824,380	1,358,538	3,207,150	
109 Bolangir	"	365,862	15,226	22,113	325,175	535,281	1,263,657	
110 Ramanathapuram	(Tamil Nadu)	872,020	38,125	55,372	814,233	1,080,457	2,860,207	
111 Aligarh	(Uttar Pradesh)	666,928	23,564	34,224	503,258	883,855	2,111,829	
112 Kheri	"	472,051	16,478	23,933	351,930	622,198	1,486,590	
113 Bareilly	"	567,366	19,637	28,520	419,379	744,965	1,779,867	
114 Rampur	"	284,307	10,068	14,623	215,035	377,176	901,209	
115 Mathura	"	410,182	14,283	20,745	305,048	540,049	1,290,307	
116 Etawah	"	459,162	16,070	23,340	343,213	605,917	1,447,702	
117 Gorakhpur	"	915,478	35,764	51,943	763,816	1,271,176	3,038,177	
118 Faizabad	"	579,459	22,741	33,029	485,688	806,364	1,927,281	
119 Kanpur	"	957,704	32,946	47,850	703,632	1,254,100	2,996,232	
120 Shahjahanpur	"	414,435	14,000	20,333	298,997	538,339	1,286,104	
121 Etah	"	496,419	17,515	25,439	374,076	657,476	1,570,925	
122 Hardoi	"	586,881	20,519	29,801	438,223	774,095	1,849,519	
123 Sitapur	"	596,856	20,952	30,430	447,477	788,685	1,884,400	
124 Farrukhabad	"	496,216	17,181	24,953	366,926	651,654	1,556,930	
125 Fatehpur	"	389,507	14,863	21,587	317,437	534,860	1,278,254	
126 Bara Banki	"	511,876	18,447	26,792	393,981	684,497	1,635,593	
127 Basti	"	908,208	34,745	50,463	742,051	1,248,623	2,984,090	
128 Ballia	"	465,921	19,249	27,957	411,108	664,700	1,588,935	
129 Jaunpur	"	577,469	24,743	35,936	528,443	838,843	2,005,434	
130 Budaun	"	526,206	18,095	26,280	386,451	688,935	1,645,967	
131 Azamgarh	"	828,990	34,994	50,825	747,377	1,195,298	2,857,484	
132 Malda	(West Bengal)	486,361	18,172	26,393	388,100	693,631	1,612,657	
Total for Level IV		33,123,537	1,301,419	1,890,262	27,794,654	46,897,836	111,007,708	
AGRICULTURAL PRODUCTIVITY LEVEL V (Rs. 600-974 per hectare)								
133 Cuddapah	(Andhra Pradesh)	479,927	19,270	27,987	411,549	638,534	1,577,267	

1	2	3	4	5	6	7	8	9
134	Anantapur	(Andhra Pradesh)	647,178	25,695	37,319	548,779	856,350	2,115,321
135	Karimnagar	"	589,587	24,329	35,335	519,591	795,086	1,963,928
136	Warangal	"	570,023	22,827	33,153	487,512	757,418	1,870,933
137	Khammam	"	417,122	16,724	24,290	357,176	554,580	1,369,892
138	Medak	"	440,336	18,199	26,432	388,687	594,290	1,467,944
139	Nalgonda	"	551,817	22,311	32,405	476,507	736,698	1,819,738
140	Darbhangha	(Bihar)	1,495,497	63,441	92,140	1,354,915	2,227,911	5,233,904
141	Muzaffarpur	"	1,378,924	58,857	85,482	1,257,007	2,060,411	4,840,681
142	Dhanbad + Hazaribagh	"	1,328,247	52,386	76,084	1,118,805	1,911,109	4,486,631
143	Ranchi	"	749,652	31,504	45,755	672,827	1,111,707	2,611,445
144	Monghyr + Saharsa	"	1,833,680	73,517	106,774	1,570,116	2,658,790	6,242,877
145	Palamau	"	434,085	18,051	26,217	385,524	640,473	1,504,350
146	Purnea	"	1,164,471	46,133	67,002	985,263	1,678,994	3,941,863
147	Bharuch	(Gujarat)	322,183	13,005	18,888	277,749	477,776	1,109,601
148	Mahesana	"	605,037	24,632	35,775	526,070	900,954	2,092,468
149	Surat	"	519,712	20,907	30,365	446,509	769,431	1,786,924
150	Panchmahals	"	538,570	21,594	31,363	461,191	796,086	1,848,804
151	Amreli	"	245,619	9,982	14,498	213,191	365,440	848,730
152	Ahmadabad	"	882,980	32,498	47,199	694,054	1,253,576	2,910,307
153	Rajkot	"	472,219	19,007	27,605	405,934	699,307	1,624,072
154	Jamnagar	"	323,943	12,972	18,840	277,047	478,541	1,111,343
155	Bhavnagar	"	409,051	16,427	23,859	350,844	605,104	1,405,285
156	Kutch	"	239,082	10,285	14,938	219,656	365,808	849,769
157	The Dangs	"	27,401	1,102	1,600	23,528	40,554	94,185
158	Hisar	(Haryana)	617,092	22,248	32,313	475,161	986,134	2,132,948
159	Gurgaon	"	495,410	17,749	25,778	379,069	789,363	1,707,369
160	Jammu Region†	(Jammu & Kashmir)	516,202	18,769	27,261	400,860	724,388	1,687,480
161	Raichur	(Karnataka)	416,271	16,735	24,305	357,403	601,026	1,415,740
162	Bidar	"	244,499	9,651	14,016	206,107	349,786	824,059
163	Dharwar	"	700,974	27,182	39,479	580,531	994,047	2,342,213
164	Bilaspur	(Madhya Pradesh)	686,147	28,896	41,968	617,128	1,066,823	2,440,962
165	Bastar	"	427,647	17,882	25,971	381,909	662,547	1,515,956
166	Bhind	"	243,816	8,533	12,393	182,241	346,972	793,955
167	Narsimhapur	"	151,910	5,898	8,566	125,957	226,939	519,270
168	Raigarh	"	358,760	15,166	22,026	323,895	558,858	1,278,705
169	Tikamgarh	"	170,684	6,283	9,125	134,176	248,617	568,885
170	Durg	"	695,908	28,981	42,091	618,951	1,075,970	2,461,901
171	Gwalior	"	262,844	9,248	13,432	197,517	374,964	858,005
172	Morena	"	302,111	10,610	15,410	226,596	430,611	985,338
173	Surguja	"	380,252	15,392	22,355	328,729	579,711	1,326,439
174	Shajapur	"	197,852	7,730	11,226	165,083	296,468	678,359
175	Indore	"	307,232	11,336	16,464	242,101	448,017	1,025,150
176	Mandsaur	"	281,630	10,906	15,840	232,927	420,219	961,522
177	Seoni	"	189,531	7,842	11,390	167,488	292,101	668,352
178	Mandla	"	246,569	10,299	14,958	219,956	381,795	873,577
179	Chhatarpur	"	215,318	7,801	11,380	166,607	314,329	712,385
180	Chhindwara	"	283,237	11,498	16,699	245,563	432,416	989,413
181	Ujjain	"	253,289	9,756	14,169	208,353	376,949	862,516
182	Dewas	"	173,550	6,764	9,823	144,453	259,746	594,336
183	East Nimar	"	256,058	10,037	14,577	214,359	384,300	879,331
184	Shahdol	"	296,713	11,888	17,266	253,890	450,082	1,029,839
185	West Nimar	"	371,126	14,791	21,482	315,899	561,514	1,284,812
186	Raisen	"	163,928	6,191	8,992	133,227	241,688	553,026
187	Sagar	"	316,191	11,838	17,193	252,817	464,252	1,062,291
188	Bhandara	(Maharashtra)	472,300	19,213	27,905	410,346	655,816	1,585,580
189	Sangli	"	467,620	18,290	26,564	390,621	636,725	1,539,820
190	Satara	"	501,901	21,453	31,157	458,167	714,698	1,727,376

†Doda, Udhampur, Jammu and Kathua

1	2	3	4	5	6	7	8	9
191	Keonjhar	(Orissa)	278,933	11,417	16,582	243,836	404,746	955,514
192	Sundargarh	"	306,346	12,088	17,556	258,162	436,606	1,030,758
193	Balasore	"	535,747	21,814	31,682	465,879	775,382	1,830,504
194	Mayurbhanj	"	416,617	17,223	25,014	367,827	607,519	1,434,200
195	Baudh Khandmals	"	179,036	7,531	10,937	160,830	267,341	621,675
196	Bharatpur	(Rajasthan)	450,780	16,004	23,243	341,790	658,389	1,490,206
197	Banswara	"	184,141	7,616	11,061	162,657	289,111	654,586
198	Chittaurgarh	"	272,513	10,712	15,558	228,785	417,413	944,981
199	Alwar	"	410,348	15,383	22,341	328,529	614,561	1,391,162
200	Ganganagar	"	413,976	15,296	22,216	326,685	615,838	1,094,011
201	Udaipur	"	512,945	20,751	30,138	443,178	796,668	1,803,680
202	Bundi	"	132,535	4,961	7,206	105,959	198,360	449,021
203	Dungarpur	"	146,425	6,285	9,129	134,239	234,180	530,258
204	Sawai Madhopur	"	356,326	13,017	18,905	277,998	527,282	1,193,528
205	Bhilwara	"	307,407	11,823	17,171	252,505	465,984	1,054,890
206*	Kota	"	337,861	12,629	18,342	269,719	505,319	1,143,870
207	Jaipur	"	731,028	27,499	39,939	587,305	1,096,614	2,482,385
208	Mainpuri	(Uttar Pradesh)	456,662	16,123	23,417	344,338	604,994	1,445,534
209	Varanasi	"	865,463	33,326	48,402	711,745	1,193,523	2,852,459
210	Ghazipur	"	448,658	18,575	26,978	396,709	640,734	1,531,654
211	Unnao	"	455,110	17,142	24,897	366,106	621,138	1,484,393
212	Rae Bareli	"	450,120	18,002	26,145	384,464	632,081	1,510,812
213	Sultanpur	"	483,079	19,847	28,826	423,877	687,299	1,642,928
214	Lucknow	"	508,957	18,135	26,340	387,321	677,093	1,617,846
215	Allahabad	"	896,186	34,106	49,534	728,396	1,229,056	2,937,278
216	Agra	"	731,099	25,674	37,289	548,335	966,242	2,308,638
217	Pratapgarh	"	408,757	17,592	25,551	375,718	595,089	1,422,707
218	Gonda	"	710,938	26,366	38,294	563,110	963,321	2,302,029
219	Mirzapur	"	468,970	17,946	26,064	383,276	644,832	1,541,088
220	Jalaun	"	253,674	9,214	13,382	196,782	340,438	813,490
221	Banda	"	366,009	13,502	19,610	288,370	494,724	1,182,215
222	Hamirpur	"	304,726	11,338	16,467	242,154	413,530	988,215
223	Jhansi	"	404,608	14,930	21,684	318,869	546,967	1,307,058
224	Bahraich	"	543,234	19,361	28,119	413,495	722,763	1,726,972
Total for Level V			43,060,129	1,695,739	2,462,898	36,216,065	62,204,936	145,639,567
AGRICULTURAL PRODUCTIVITY LEVEL VI (less than Rs. 600 per hectare)								
225	Hyderabad	(Andhra Pradesh)	859,366	33,693	48,935	719,585	1,130,185	2,791,762
226	Adilabad	"	388,498	15,887	23,075	339,312	521,576	1,288,348
227	Mahbubnagar	"	579,107	23,973	34,817	511,990	782,195	1,932,082
228	Banaskantha	(Gujarat)	369,134	14,758	21,434	315,183	544,874	1,265,383
229	Surendranagar	"	246,582	9,862	14,324	210,634	364,052	845,454
230	Mahendragarh	(Haryana)	196,466	7,366	10,698	157,310	319,799	691,639
231	Gulbarga	(Karnataka)	511,430	20,556	29,856	439,025	738,353	1,739,220
232	Bijapur	"	585,643	23,396	33,980	499,670	842,902	1,985,591
233	Betul	(Madhya Pradesh)	209,260	8,618	12,516	184,051	321,751	736,196
234	Jabalpur	"	496,584	19,009	27,608	405,977	736,852	1,686,030
235	Hoshangabad	"	237,306	9,088	13,199	194,086	352,191	805,870
236	Vidisha	"	197,024	7,293	10,593	155,767	287,750	658,427
237	Shivpuri	"	204,499	7,408	10,760	158,225	295,675	676,567
238	Sehore	"	326,795	11,928	17,324	254,743	474,143	1,084,933
239	Dhar	"	241,825	9,761	14,177	208,473	368,164	842,400
240	Damoh	"	116,357	6,568	9,538	140,262	250,538	573,263
241	Ratlam	"	181,841	7,177	10,423	153,274	273,819	626,534
242	Rajgarh	"	190,289	7,243	10,520	154,695	281,599	644,346
243	Panna	"	125,708	4,865	7,067	103,916	187,521	429,077

1	2	3	4	5	6	7	8	9
244	Datia	(Madhya Pradesh)	76,464	2,824	4,102	60,319	111,558	255,267
245	Satna	"	263,908	10,516	15,273	224,584	399,250	913,531
246	Rewa	"	279,228	11,394	16,548	243,341	427,383	977,894
247	Guna	"	234,330	8,690	12,621	185,587	342,520	783,748
248	Sidhi	"	223,107	8,996	13,066	192,129	339,488	776,786
249	Jhabua	"	191,087	7,764	11,277	165,821	291,862	667,811
250	Chanda	(Maharashtra)	492,714	19,703	28,616	420,799	678,305	1,640,137
251	Nasik	"	722,836	28,004	40,672	598,083	979,626	2,369,221
252	Ahmednagar	"	686,610	27,055	39,294	577,818	938,340	2,269,117
253	Dhulia	"	502,794	19,825	28,794	423,409	687,359	1,662,181
254	Yeatmal	"	429,690	17,020	24,720	363,499	588,748	1,423,677
255	Jalgaon	"	644,968	25,210	36,614	538,411	877,920	2,123,121
256	Poona	"	972,839	37,430	54,363	799,404	1,313,993	3,178,029
257	Wardha	"	236,744	9,260	13,448	197,757	322,353	779,562
258	Nagpur	"	598,258	22,733	33,018	485,519	803,160	1,942,688
259	Amravati	"	472,300	18,131	26,333	387,224	637,221	1,541,209
260	Buldhana	"	382,483	15,045	21,852	321,330	522,268	1,262,978
261	Akola	"	457,779	17,759	25,794	379,290	620,836	1,501,478
262	Nanded	"	423,031	16,662	24,200	355,860	578,009	1,397,762
263	Osmanabad	"	577,292	22,475	32,643	480,009	784,268	1,896,687
264	Sholapur	"	689,996	26,543	38,550	566,876	931,875	2,253,840
265	Parbhani	"	454,895	18,008	26,155	384,605	623,108	1,506,771
266	Aurangabad	"	600,370	23,337	33,894	498,415	814,990	1,971,006
267	Bhir	"	389,526	15,320	22,250	327,187	531,838	1,286,121
268	Sirohi	(Rajasthan)	120,485	4,878	7,084	104,174	187,194	423,815
269	Jhalawar	"	180,329	7,011	10,182	149,725	274,754	622,001
270	Tonk	"	182,425	7,012	10,184	149,758	276,451	625,830
271	Jalor	"	192,446	7,579	11,008	161,874	295,043	667,950
272	Pali	"	276,838	11,118	16,148	237,451	428,447	970,002
273	Ajmer	"	334,325	12,869	18,691	274,851	506,993	1,147,729
274	Sikar	"	295,864	12,023	17,462	256,777	460,522	1,042,648
275	Jhunjhun	"	268,163	10,526	15,287	224,797	410,457	929,230
276	Jodhpur	"	337,686	12,844	18,655	274,320	509,207	1,152,712
277	Nagaur	"	361,650	14,406	20,923	307,677	557,501	1,262,157
278	Barmer	"	228,526	8,568	12,444	182,989	342,278	774,805
279	Churu	"	250,024	10,003	14,529	213,643	386,240	874,439
280	Bikaner	"	167,751	6,393	9,285	136,534	253,186	573,149
281	Jaisalmer	"	51,274	1,756	2,550	37,500	73,681	166,761
Total for Level VI			20,564,769	805,139	1,169,373	17,195,524	29,182,171	68,916,981

APPENDIX III

District Level Data on Growth Rates of Population, In-migration, Urbanization and Agricultural and Non-Agricultural Workers, India, 1961-71

Sl. No.	District	State	Population growth rate, 1961-71	In-migration, 1961	In-migration, 1971	Growth rate of in-migration, 1961-71	Growth rate of urban population, 1961-71	Growth rate of non-agricultural workers, 1961-71	Growth rate of rural population, 1961-71	Growth rate of male cultivators, 1961-71	Growth rate of male agricultural labourers, 1961-71
1	2	3	4	5	6	7	8	9	10	11	12
1	West Godavari	(AP)	20.02	204,651	228,935	11.86	33.89	- 11.24	17.40	- 2.33	38.11
2	Chittoor	"	19.37	144,771	178,170	23.07	40.00	- 6.50	16.69	- 1.56	45.30
3	East Godavari	"	18.35	157,806	189,193	19.88	22.77	- 17.54	17.35	- 0.73	39.48
4	Krishna	"	20.05	276,544	299,879	8.43	39.18	- 2.17	14.18	- 4.48	35.18
5	Khera	(Gujarat)	23.96	191,263	261,858	36.90	27.42	4.20	23.12	8.97	80.28
6	Karnal	(Haryana)	32.93	388,822	421,013	8.27	31.88	- 0.31	33.15	4.62	151.54
7	Mandya	(Karnataka)	28.37	94,554	119,051	25.90	58.67	3.11	24.58	3.27	123.45
8	Shimoga	"	27.92	243,301	256,968	5.61	18.03	- 28.69	31.33	- 0.61	198.75
9	Coorg	"	17.17	99,653	87,593	- 12.10	37.48	3.37	14.08	1.27	69.60
10	South Kanara	"	24.01	54,475	91,825	68.56	40.24	33.49	20.46	- 17.76	82.42
11	North Kanara	"	23.13	99,973	110,295	10.32	24.51	- 3.57	22.84	2.55	76.34
12	Kozhikode, + Malappuram, + Palghat, + Ernakulam, + Kottayam	(Kerala)	27.43	627,799	861,552	37.23	51.95	- 9.48	23.22	2.98	89.60
13	Alleppey	"	17.73	90,084	106,695	18.43	15.86	- 16.88	18.12	0.79	81.72
14	Quilon	"	23.92	126,979	149,574	17.79	31.66	4.86	23.30	8.01	81.37
15	Trichur	"	26.09	80,939	92,765	14.61	34.57	- 12.97	29.20	13.77	199.87
16	Trivandrum	"	26.02	81,762	107,405	31.36	27.41	2.07	25.54	- 10.25	150.05
17	Kolhapur	(Maharashtra)	28.28	166,226	235,987	41.96	43.04	23.19	24.75	14.81	21.47
18	Ludhiana	(Punjab)	38.81	311,927	368,530	18.14	56.97	25.00	30.74	35.03	228.20
19	Amritsar	"	19.58	353,205	294,962	- 16.48	15.39	- 4.51	21.39	14.67	154.57
20	Kapurthala	"	24.93	115,291	129,422	12.25	25.81	3.15	24.67	14.68	282.26
21	Jullundur	"	18.50	352,732	340,665	- 3.42	24.90	- 4.08	15.95	9.31	167.15
22	Ferozpur	"	17.70	514,873	421,075	- 18.21	16.36	- 21.35	18.04	13.90	107.42
23	Gurdaspur	"	24.41	304,261	269,076	- 11.56	24.92	- 10.94	24.29	10.99	176.29
24	Sangrur	"	20.15	242,799	168,746	- 30.49	26.59	- 30.28	18.61	- 27.23	46.12
25	Patiala	"	15.85	325,705	314,358	- 3.48	22.27	- 5.59	13.75	3.79	108.07
26	Bhatinda	"	24.92	227,883	207,145	- 9.10	17.93	- 11.53	26.79	21.03	121.81
27	Coimbatore	(Tamil Nadu)	22.92	252,978	375,631	48.48	50.77	- 13.51	11.54	- 0.15	117.16
28	Kanya Kumari	"	22.63	34,833	51,282	47.22	36.19	- 32.83	20.22	- 15.28	400.02
29	South Arcot	"	18.69	177,253	282,161	59.18	30.75	- 12.66	16.91	- 1.99	52.18
30	Chingleput	"	32.37	247,207	504,862	104.22	121.79	9.22	8.97	- 12.65	71.89
31	Madurai	"	22.63	216,930	314,995	45.20	30.36	- 15.03	19.06	- 5.92	110.84
32	Thanjavur	"	18.32	225,041	299,734	33.19	19.12	- 13.29	18.11	- 3.75	55.16
33	North Arcot	"	19.37	170,054	231,150	35.92	24.05	- 12.07	18.19	- 6.25	121.09
34	Muzaffarnagar	(UP)	24.73	195,833	185,058	- 5.50	30.70	- 32.97	23.82	8.57	158.38
35	Meerut	"	24.10	351,776	449,875	27.88	46.20	- 11.24	18.37	3.62	227.13
36	Bijnor	"	25.12	74,426	74,664	0.31	37.66	- 25.98	22.65	11.99	169.88
37	Saharanpur	"	27.19	198,904	246,028	23.69	29.75	- 24.36	26.43	12.50	228.84
38	Naini Tal	"	37.56	280,158	276,782	- 1.20	55.89	- 11.80	33.11	18.18	56.45
39	Burdwan	(West Bengal)	27.03	660,953	748,086	13.18	58.97	- 11.69	19.92	- 4.82	88.79
40	Hooghly	"	28.71	500,641	506,701	1.21	31.24	2.41	27.82	- 3.01	87.32
41	Birbhum	"	22.80	131,781	140,680	6.75	23.81	- 15.55	22.72	- 5.62	58.53
42	Srikakulam + Visakhapatnam	(AP)	16.48	192,215	280,310	45.83	45.90	- 11.66	11.96	- 2.23	43.43

1	2	3	4	5	6	7	8	9	10	11	12
43	Cachar	(Assam)	24.29	165,749	14,087	- 91.50	40.15	- 18.43	23.09	3.10	205.99
44	Sibsagar	"	21.81	127,693	151,575	18.70	101.71	- 2.35	17.53	6.17	166.66
45	Kashmir Valley	(J & K)	26.88	60,966	80,244	31.62	41.40	30.47	23.56	3.26	115.77
46	Cannanore	(Kerala)	32.85	152,390	227,447	49.25	8.25	- 6.91	37.83	22.66	184.00
47	Kolar	(Karnataka)	17.55	131,815	126,893	- 3.73	6.76	- 1.95	20.73	6.74	177.88
48	Kolaba	(Maharashtra)	19.28	68,679	114,174	66.24	43.03	- 0.06	16.61	1.88	78.41
49	Tirunelveli	(Tamil Nadu)	17.22	76,963	121,792	58.24	21.41	- 14.19	15.33	- 13.04	128.76
50	Tiruchirappally	"	20.64	293,689	408,615	39.13	26.38	- 6.68	19.10	2.07	74.47
51	Bulandshahr	(UP)	19.33	199,119	200,291	0.58	25.70	- 21.14	18.41	1.87	96.90
52	Howrah	(WB)	18.58	426,976	316,596	- 25.85	22.83	- 9.63	15.68	- 12.81	118.32
53	Bankura	"	22.02	95,058	99,369	4.53	24.21	- 23.01	21.84	- 8.89	76.78
54	Midnapore	"	26.88	215,593	237,550	10.28	25.68	- 15.06	26.98	- 4.08	99.58
55	Murshidabad	"	28.39	153,882	178,790	16.18	27.09	- 22.44	28.51	4.36	114.30
56	Nizamabad	(AP)	28.49	165,461	199,745	20.72	41.19	12.95	26.34	9.90	40.94
57	Lakhimpur	(Assam)	35.73	347,226	405,770	16.86	67.08	- 3.34	32.37	15.82	244.84
58	Nowgong	"	38.82	223,503	279,351	24.98	46.93	2.56	38.24	14.56	176.47
59	Darrang	"	34.62	284,769	298,044	4.66	106.27	3.85	31.71	9.84	128.90
60	Patna	(Bihar)	20.58	262,162	299,374	14.19	35.00	- 20.46	16.94	6.48	75.58
61	Saran	"	19.36	117,094	137,678	17.57	19.75	- 37.15	19.35	5.21	135.78
62	Junagadh	(Gujarat)	32.99	113,647	158,745	39.68	38.14	0.20	30.97	22.28	108.57
63	Vadodara	"	29.64	1,695,028	292,648	- 82.73	51.75	28.77	21.86	4.03	55.72
64	Ambala	(Haryana)	24.00	403,420	282,013	- 30.09	14.54	- 36.45	- 19.29	- 38.21	79.27
65	Rohtak	"	25.70	234,590	260,665	11.11	43.92	- 3.76	22.81	- 2.22	108.47
66	Chikmagalur	(Karnataka)	23.32	151,012	143,811	- 4.76	28.61	- 2.88	22.39	0.93	87.65
67	Mysore	"	24.28	109,963	155,971	41.83	27.50	- 1.69	23.21	5.89	94.45
68	Tumkur	"	19.03	104,619	122,965	17.53	37.13	- 10.65	16.98	- 2.65	159.96
69	Thana	(Maharashtra)	38.05	352,108	600,764	70.61	65.57	42.91	26.14	- 3.03	69.87
70	Hoshiarpur	(Punjab)	20.78	196,196	169,615	- 13.54	34.50	31.98	- 14.92	- 33.76	250.68
71	Dharmapuri + Salem	(Tamil Nadu)	22.77	129,563	252,044	94.53	52.15	- 14.68	17.08	- 0.33	136.12
72	Deoria	(UP)	18.41	139,869	181,325	29.63	44.34	2.84	17.76	- 11.08	133.76
73	Pilibhit	"	22.05	96,175	92,842	- 3.46	21.90	- 25.66	22.07	20.28	88.02
74	Moradabad	"	23.07	148,979	155,394	4.30	31.88	- 3.04	20.56	10.60	100.66
75	Dehra Dun	"	34.56	149,665	199,445	33.26	37.37	22.88	32.16	9.76	12

1	2	3	4	5	6	7	8	9	10	11	12
97	Balaghat	(MP)	21.18	80,363	88,916	10.64	46.73	- 0.23	19.62	5.93	38.70
98	Ratnagiri	(Maharashtra)	8.94	100,691	130,414	29.51	13.06	- 11.76	8.57	- 7.88	66.70
99	Ganjam	(Orissa)	22.49	46,380	71,750	54.70	66.74	- 33.00	18.48	- 2.41	116.93
100	Sambalpur	"	22.28	126,222	191,555	51.76	92.22	- 24.32	15.49	4.44	66.24
101	Cuttack	"	22.23	264,127	292,021	10.56	56.36	- 18.39	22.90	- 1.47	111.69
	+ Puri	"									
102	Dhenkanal	"	25.75	36,966	46,644	26.18	10.03	- 26.39	26.50	3.64	128.20
103	Kalahandi	"	27.88	133,593	240,942	80.35	112.05	- 31.07	24.18	9.47	77.32
	+ Koraput	"									
104	Bolangir	"	18.24	62,605	59,351	- 5.19	74.51	- 35.68	15.50	4.38	59.18
105	Ramanathapuram	(Tamil Nadu)	18.10	124,627	193,499	55.26	24.55	- 1.19	15.98	- 12.77	112.95
106	Aligarh	(UP)	19.63	217,647	261,113	19.97	31.50	- 18.03	17.32	4.71	97.81
107	Lakhimpur Kheri	"	18.13	131,238	158,898	21.07	32.68	- 14.38	17.27	9.18	17.50
108	Bareilly	"	20.38	159,857	170,624	6.73	21.50	- 8.54	20.06	10.03	128.74
109	Rampur	"	28.46	99,238	102,247	3.03	20.59	2.51	30.52	21.55	50.37
110	Mathura	"	20.44	177,278	167,327	- 5.61	18.46	- 20.12	20.84	4.02	115.78
111	Etawah	"	22.45	140,599	131,433	- 6.51	32.08	- 13.23	21.49	- 1.77	186.95
112	Gorakhpur	"	18.43	190,402	196,658	3.28	28.19	- 11.54	17.67	- 14.93	134.87
113	Faizabad	"	17.99	125,416	140,972	12.40	29.90	- 14.87	16.86	- 0.39	71.05
114	Kanpur	"	25.82	524,602	539,774	2.89	31.34	7.32	21.98	0.98	147.26
115	Shahjahanpur	"	13.78	120,124	128,770	7.19	24.38	- 21.49	12.07	1.26	123.49
116	Etah	"	20.87	174,351	144,876	- 16.90	23.25	- 23.87	20.61	6.40	155.47
117	Hardoi	"	17.56	98,625	108,456	9.96	27.89	- 21.23	16.75	4.94	124.98
118	Sitapur	"	17.18	108,160	90,125	- 16.67	15.74	- 17.71	17.30	7.13	88.54
119	Farrukhabad	"	20.21	169,881	169,463	- 0.24	18.74	- 10.81	20.40	4.22	115.38
120	Fatehpur	"	19.13	69,830	28,750	- 58.82	68.17	- 34.04	17.10	- 2.55	132.34
121	Bara Banki	"	15.62	98,739	89,662	- 9.19	34.11	- 27.02	14.66	5.37	99.52
122	Basti	"	13.59	114,976	98,828	- 14.04	96.07	- 13.16	12.36	- 4.72	96.58
123	Ballia	"	18.94	90,552	102,107	12.76	44.82	- 37.00	17.93	- 14.43	158.11
124	Jaunpur	"	16.10	140,665	166,408	18.30	36.24	- 19.24	14.97	- 7.43	79.91
125	Budaun	"	16.59	122,451	132,517	8.22	29.13	- 20.47	15.44	8.98	74.03
126	Azamgarh	"	18.66	143,133	166,120	16.05	29.25	- 19.03	18.13	- 7.45	101.89
127	Malda	(West Bengal)	31.97	119,720	130,879	9.32	33.94	- 37.59	31.89	9.87	189.65
128	Cuddapah	(AP)	17.52	54,477	70,409	29.24	26.27	- 17.41	16.20	- 2.34	53.90
129	Anantapur	"	19.68	132,403	156,459	18.16	22.15	- 1.72	19.15	- 0.92	62.59
130	Karimnagar	"	21.11	72,767	103,517	42.25	83.79	- 17.21	16.35	12.27	46.87
131	Warangal	"	21.06	123,304	126,831	2.86	15.32	- 10.96	22.00	6.05	41.29
132	Khammam	"	29.53	173,139	209,218	20.83	44.97	- 0.02	27.40	10.98	51.04
133	Medak	"	19.60	78,004	103,465	32.64	31.73	- 6.34	18.58	7.66	28.82
134	Nalgonda	"	15.54	128,588	107,434	- 16.45	- 16.97	- 21.55	18.88	4.68	30.18
135	Darbhanga	(Bihar)	18.60	194,643	212,242	9.04	21.74	- 47.72	18.45	8.87	67.80
136	Muzaffarpur	"	17.53	207,731	243,636	17.28	34.49	- 34.45	16.72	- 1.22	80.34
137	Dhanbad	"	26.20	543,113	693,327	27.65	109.08	- 28.65	12.92	1.97	191.03
	+ Hazaribagh	"									
138	Ranchi	"	22.11	127,457	187,489	47.09	76.27	- 12.06	16.44	- 3.86	214.80
139	Monghyr	"	22.15	371,361	414,398	11.58	28.44	- 42.45	21.55	5.36	106.97
	+ Saharsa	"									
140	Palamau	"	26.65	58,188	75,299	29.40	25.62	- 40.61	26.70	9.46	96.04
141	Purnea	"	27.60	355,180	357,823	0.74	34.72	- 39.15	27.14	15.16	90.36
142	Bharuch	(Gujarat)	24.39	87,397	112,832	29.10	44.25	8.53	20.89	- 2.59	52.19
143	Mahesana	"	28.13	105,381	165,756	57.29	29.62	- 29.49	27.80	7.41	157.66
144	Surat	"	36.00	169,743	273,121	60.90	67.15	- 14.52	24.23	9.73	39.65
145	Panchmahals	"	25.85	68,353	79,195	15.86	33.77	- 6.02	24.92	16.78	117.10
146	Amreli	"	27.08	82,391	102,666	24.60	18.36	- 11.76	29.45	16.69	64.86
147	Ahmadabad	"	36.61	694,715	864,203	24.39	44.82	18.78	22.60	4.32	112.62
148	Rajkot	"	34.38	153,962	217,013	40.95	33.17	10.64	35.15	21.13	119.00
149	Jamnagar	"	34.15	94,017	129,929	38.19	33.62	11.84	34.44	28.86	142.20
150	Bhavnagar	"	25.53	80,773	112,097	38.78	27.57	- 6.09	24.59	14.57	75.47

1	2	3	4	5	6	7	8	9	10	11	12
151	Kutch	(Gujarat)	22.01	45,017	63,293	40.59	58.81	- 7.57	13.16	17.93	151.87
152	The Dangs	"	31.60	10,227	12,520	22.42	0.00	7.44	31.60	33.85	8.65
153	Hisar	(Haryana)	38.45	349,448	443,486	26.91	40.98	25.82	37.98	4.15	182.77
154	Gurgaon	"	37.61	218,796	310,041	41.70	53.68	30.13	34.41	1.53	174.17
155	Jammu Region	(J & K)	35.34	164,858	181,521	10.10	50.88	19.16	32.80	7.10	179.53
156	Raichur	(Karnataka)	28.59	98,373	136,465	38.72	35.39	4.58	27.43	- 4.82	129.22
157	Bidar	"	24.26	43,381	53,301	22.86	46.67	1.42	21.13	- 2.83	34.99
158	Dharwar	"	20.09	172,512	215,403	24.86	40.66	16.23	12.51	- 12.08	60.06
159	Bilaspur	(MP)	20.73	164,784	205,675	24.81	56.80	- 7.82	17.45	- 1.55	58.03
160	Bastar	"	29.84	65,478	136,977	109.19	110.54	- 16.77	27.94	11.72	57.96
161	Bhind	"	23.82	78,958	97,633	23.65	54.02	- 3.96	21.40	- 0.73	177.12
162	Narsimhapur	"	25.91	36,320	45,450	25.13	37.40	- 29.30	24.36	6.79	74.18
163	Raigarh	"	22.80	112,153	132,010	17.70	26.79	- 27.78	22.56	6.91	80.39
164	Tikamgarh	"	24.84	38,864	37,675	- 3.05	36.32	- 26.94	24.30	12.89	122.88
165	Durg	"	30.58	228,948	302,049	31.92	68.58	- 3.67	25.16	10.61	31.82
166	Gwalior	"	30.42	156,046	183,531	17.61	36.53	6.03	24.46	13.36	101.31
167	Morena	"	25.78	88,128	94,939	7.72	53.43	- 24.31	23.19	11.64	74.01
168	Surguja	"	27.94	112,719	144,173	27.90	103.33	- 18.38	24.61	9.37	98.48
169	Shajapur	"	28.93	80,037	93,771	17.15	46.67	- 12.68	26.94	13.35	45.74
170	Indore	"	36.03	224,046	262,406	17.12	42.20	19.88	26.77	17.81	46.57
171	Mandsaur	"	27.84	116,563	118,420	1.59	21.93	- 13.31	29.43	18.25	81.39
172	Seoni	"	27.61	38,948	62,084	59.40	43.93	- 14.32	26.60	8.61	54.60
173	Mandla	"	27.62	46,060	49,084	6.56	46.93	- 15.33	26.63	13.10	67.18
174	Chhatarpur	"	21.28	48,768	69,377	42.25	42.15	- 43.71	19.07	14.63	88.70
175	Chhindwara	"	25.95	74,844	85,150	13.76	68.12	- 11.81	19.91	9.02	56.89
176	Ujjain	"	30.34	144,280	159,503	10.55	42.80	4.25	24.36	11.42	39.47
177	Dewas	"	32.99	77,880	82,356	5.74	40.80	- 14.12	31.60	18.26	56.50
178	Khandwa	"	28.34	125,979	141,293	12.15	33.75	4.36	26.76	7.49	43.46
179	Shahdol	"	24.12	80,890	92,352	14.16	110.92	- 17.28	17.63	3.85	68.61
180	Khargone	"	29.71	72,054	94,467	31.10	32.38	- 15.40	29.28	13.30	50.41
181	Raisen	"	34.41	63,816	85,654	34.22	40.88	- 35.33	34.05	12.91	97.89
182	Sagar	"	33.36	84,633	138,489	63.63	44.02	- 13.88	30.23	20.38	92.96
183	Sangli	(Maharashtra)	25.11	165,735	223,780	35.02	49.09	22.10	20.67	1.60	71.04
184	Satara	"	20.78	144,374	190,321	31.82	43.44	- 1.44	17.96	0.03	86.88
185	Keonjhar	(Orissa)	28.54	54,443	92,465	69.83	110.69	13.55	24.85	0.63	87.82
186	Sundargarh	"	35.87	121,623	196,955	61.93	76.55	4.77	27.00	- 1.78	79.82
187	Balasore	"	29.27	85,292	111,655	30.90	8.97	- 17.37	30.68	- 3.36	125.06
188	Mayurbhanj	"	19.11	58,482	76,280	30.43	40.57	- 23.62	18.59	- 7.00	63.86
189	Bharatpur	(Rajasthan)	29.59	157,370	187,515	19.15	30.66	5.93	29.42	6.36	177.08
190	Banswara	"	37.73	18,082	25,300	39.91	33.72	- 6.17	37.95	15.87	283.59
191	Chittaurgarh	"	33.07	73,201	114,655	56.63	44.59	0.36	31.85	20.13	114.86
192	Alwar	"	27.62	151,992	165,332	8.77	44.36	- 2.18	26.15	4.79	190.11
193	Ganganagar	"	34.37	373,953	348,310	- 6.85	53.22	1.01	31.18	17.92	62.03
194	Udaipur	"	23.17	70,718	108,865	53.94	38.68	- 5.19	21.27	3.16	236.13
195	Bundi	"	32.84	36,729	55,350	50.69	26.68	9.86	33.95	18.15	81.33
196	Dungarpur	"	30.30	20,222	25,821	27.68	45.99	- 1.73	29.43	3.36	338.54
197	Sawai Madhopur	"	26.49	63,634	83,114	30.61	47.80	- 10.51	24.07	7.20	108.12
198	Bhilwara	"	21.84	52,628	86,533	64.42	83.35	6.56	16.97	5.97	315.48
199	Kota	"	34.82	117,701	162,084	37.70	71.82	- 0.99	26.22	15.90	63.85
200	Jaipur	"	30.53	183,158	256,852	40.28	49.37	- 3.71	23.82	11.99	145.64
201	Mainpuri	(UP)	22.41	172,905	155,170	- 10.25	39.99	- 21.65	21.00	5.23	218.17
202	Varanasi	"	20.75	236,926	237,012	0.03	29.58	- 3.50	18.05	- 3.87	71.22
203	Ghazipur	"	15.89	103,409	116,486	12.64	52.81	- 26.56	14.58	- 7.65	100.62
204	Unnao	"	20.98	83,288	99,704	19.70	28.25	- 7.26	20.80	2.24	108.17
205	Rae Bareilly	"	14.89	87,634	89,992	2.69	29.00	- 31.23	14.45	1.70	54.35
206	Sultanpur	"	16.27	127,269	88,860	- 30.17	23.95	- 26.72	16.12	- 2.74	54.49

	1	2	3	4	5	6	7	8	9	10	11	12
	207	Lucknow	(UP)	20.83	323,042	283,922	- 12.10	24.13	4.99	17.59	3.91	132.68
	208	Allahabad	"	20.46	192,803	184,383	- 4.36	22.10	- 6.77	20.09	- 5.34	74.83
	209	Agra	"	23.97	304,178	315,530	3.73	26.53	4.16	22.54	4.99	129.63
	210	Pratapgarh	"	13.61	92,915	82,269	- 11.45	30.43	- 27.10	13.32	- 4.29	47.64
	211	Gonda	"	11.03	130,418	92,991	- 28.69	28.50	- 26.30	10.13	3.87	74.48
	212	Mirzapur	"	23.32	116,077	120,932	4.18	28.98	- 25.86	22.58	2.14	78.10
	213	Jalaun	"	22.66	68,827	72,048	4.67	32.06	- 22.52	21.29	1.36	124.55
	214	Banda	"	23.95	54,335	66,715	22.78	54.35	- 30.51	21.78	2.57	72.97
	215	Hamirpur	"	24.38	66,790	63,945	- 4.25	47.18	- 45.67	22.30	5.02	126.76
	216	Jhansi	"	20.19	143,629	162,274	12.98	23.97	- 22.11	19.00	7.72	140.53
	217	Bahraich	"	15.13	87,092	69,449	- 20.25	28.76	- 27.79	14.37	9.92	78.55
	218	Hyderabad	(AP)	35.32	373,534	481,475	28.89	43.37	28.22	22.08	10.73	30.95
	219	Adilabad	"	27.64	144,787	168,784	16.57	31.15	- 4.54	27.00	16.14	41.09
	220	Mehbubnagar	"	21.46	71,238	83,690	17.47	8.53	- 19.69	22.90	23.14	32.20
	221	Banaskantha	(Gujarat)	27.02	72,315	94,896	31.22	69.26	- 21.32	23.80	14.36	163.71
	222	Surendranagar	"	27.47	74,367	97,479	31.07	22.98	- 10.09	29.26	14.44	150.33
	223	Mahendragarh	(Haryana)	26.24	81,605	103,119	26.36	33.40	18.59	25.47	- 4.02	460.83
	224	Gulbarga	(Karnataka)	24.27	102,866	120,670	17.30	36.59	- 4.00	21.90	- 7.85	67.96
	225	Bijapur	"	19.60	111,458	152,689	36.99	34.38	3.23	16.16	- 16.07	64.76
	226	Betul	(MP)	31.36	36,701	41,171	12.17	43.71	- 7.56	30.23	13.27	67.85
	227	Jabalpur	"	32.35	248,112	286,648	15.53	44.62	- 0.43	25.12	7.30	79.82
	228	Hoshangabad	"	30.33	791,040	1,213,980	53.46	47.14	3.36	26.32	8.55	45.79
	229	Vidisha	"	34.58	68,461	108,706	58.78	44.48	- 34.38	33.09	17.33	76.12
	230	Shivpuri	"	21.25	43,014	58,202	35.30	83.26	172.69	16.61	- 63.08	71.39
	231	Sehore	"	43.75	178,131	269,549	51.32	65.27	10.54	31.64	88.53	50.94
	232	Dhar	"	30.85	61,466	72,108	17.31	28.81	- 14.18	31.08	14.75	32.41
	233	Damoh	"	30.77	43,445	62,175	43.11	41.60	- 30.41	29.20	17.22	108.82
	234	Ratlam	"	29.57	82,955	107,645	29.76	30.92	- 1.87	29.03	14.88	86.48
	235	Rajgarh	"	24.66	43,497	46,368	6.60	26.03	- 22.41	24.51	8.79	72.30
	236	Panna	(MP)	29.52	33,328	46,627	39.90	82.00	- 36.38	26.73	17.47	67.13
	237	Datia	"	27.33	38,500	49,877	29.55	27.20	- 29.41	27.35	7.42	430.51
	238	Satna	"	31.56	81,086	101,956	25.73	49.19	- 9.91	29.78	8.49	55.50
	239	Rewa	"	26.57	53,297	68,965	29.39	60.64	- 6.06	24.56	2.58	30.57
	240	Guna	"	31.53	63,663	86,281	35.52	33.79	- 20.67	31.21	20.06	55.35
	241	Sidhi	(MP)	33.89	34,660	50,300	45.12	86.49	- 10.73	33.43	17.17	46.84
	242	Jhabua	"	29.82	31,082	38,765	24.71	36.65	- 17.06	29.31	10.49	140.81
	243	Chandrapur	(Maharashtra)	32.47	114,825	195,802	70.52	74.62	2.76	28.94	10.36	51.59
	244	Nasik	"	27.70	228,785	288,967	26.30	42.84	3.94	22.49	5.81	56.69
	245	Ahmednagar	"	27.76	244,704	297,694	21.65	34.26	7.75	27.00	2.05	41.86
	246	Dhulia	"	23.01	156,435	151,589	- 3.09	33.29	3.12	21.05	1.33	38.65
	247	Yeotmal	"	29.60	142,006	173,507	22.18	40.01	5.21	28.10	10.23	26.27
	248	Jalgaon	"	20.28	174,100	210,222	20.74	26.41	0.90	18.50	- 4.69	35.90
	249	Poona	"	28.82	494,492	618,702	25.11	41.47	24.42	21.04	1.69	64.58
	250	Wardha	"	22.90	117,048	131,133	12.03	27.38	- 0.18	21.51	0.21	28.54
	251	Nagpur	"	28.41	298,533	358,885	20.21	33.97	5.76	22.37	0.18	39.30
	252	Amravati	"	25.01	166,637	196,465	17.89	31.80	5.74	22.61	- 0.40	27.37
	253	Buldhana	"	19.18	121,399	138,901	14.41	26.43	- 7.36	17.74	- 2.45	28.83
	254	Akola	"	26.24	200,307	213,441	6.55	34.43	1.13	23.91	- 2.40	33.61
	255	Nanded	"	29.46	115,209	136,982	18.89	46.39	- 9.98	26.60	12.31	29.66
	256	Osmanabad	"	28.35	116,291	141,602	21.76	51.65	- 14.82	25.60	9.52	25.28
	257	Sholapur	"	21.16	241,591	260,550	7.84	18.59	- 3.45	22.16	6.60	41.00
	258	Parbhani	"	24.91	114,389	120,990	5.77	45.13	- 21.96	21.67	12.03	29.13
	259	Aurangabad	"	28.62	140,869	187,900	33.38	51.93	7.17	24.78	6.26	24.91
	260	Bhir	"	28.42	91,617	192,369	11.73	51.34	- 22.14	25.91	12.91	33.58
	261	Sirohi	(Rajasthan)	20.29	37,392	48,026	28.43	31.11	- 18.35	18.17	4.92	104.53
	262	Jhalawar	"	26.78	63,873	69,783	9.25	56.62	- 13.96	24.30	10.55	69.36

POPULATION, FOOD AND LAND INEQUALITY

1	2	3	4	5	6	7	8	9	10	11	12
263 Tonk		(Rajasthan)	25.73	53,350	69,859	30.94	48.79	- 11.06	21.74	10.52	87.40
264 Jalore		"	22.09	30,534	45,575	49.25	19.47	- 1.86	22.21	2.99	142.65
265 Pali		"	20.39	62,344	88,870	42.54	41.30	- 13.39	18.19	- 0.39	103.25
266 Ajmer		"	17.52	173,379	168,980	- 2.53	18.18	- 3.29	17.13	8.44	116.69
267 Sikar		"	27.10	79,638	107,067	34.44	23.55	- 5.67	27.86	0.89	221.49
268 Jhunjhunun		"	29.12	60,718	87,183	43.58	27.26	23.09	29.52	- 4.05	231.70
269 Jodhpur		"	30.15	72,928	97,268	33.37	38.84	17.98	26.43	10.93	261.43
270 Nagaur		"	34.99	66,791	93,403	39.84	28.42	14.58	35.97	12.74	212.07
271 Barmer		"	19.23	34,777	52,423	50.74	41.58	- 0.22	17.78	0.65	288.72
272 Churu		"	32.68	74,601	92,723	24.29	24.31	- 5.18	36.55	13.09	473.42
273 Bikaner		"	28.93	52,275	65,560	25.41	26.12	- 16.70	30.99	36.44	1335.98
274 Jaisalmer		"	18.82	11,797	21,345	80.93	78.41	- 52.69	12.40	29.10	1950.25

(AP) Andhra Pradesh (MP) Madhya Pradesh
 (MP) Madhya Pradesh (UP) Uttar Pradesh
 (J&K) Jammu & Kashmir

APPENDIX IV
 Physical, Climatic and Agricultural Characteristics of Relatively More Endowed and Less Endowed Districts (the latter marked with asterisks)
 (Gini Level 0.386 to 0.489)

District	Physical Features	Soil	Rainfall (in mm)	Per cent of land irrigated to gross cropped area (1970-73)	Average Agricul- tural growth rate (1962-65 to 1970- 73)	Average Agricul- tural produc- tivity level (Rs/hect. for 1962-65 to 1970-73)	Gini Concentra- tion ratio (1971)	Remarks
1	2	3	4	5	6	7	8	9
JAMMU AND KASHMIR								
1. Kashmir Valley	Vale of Kashmir with some mountainous rugged terrain.	Mostly forest and hilly soil with river alluvium	900	66.22	5.44	1506	0.477	
UTTAR PRADESH								
2. Bulandshahr	Upper Ganga plain	Alluvium including saline	674	81.80	4.78	1456	0.484	
WEST BENGAL								
3. Howrah	Lower Ganga plain (Active Delta) — monotonously flat	Alluvium	1520	12.51	1.10	1565	0.460	
4. Hooghly	Lower Ganga plain (Active Delta) — monotonously flat	Alluvium	1520	52.05	4.25	1983	0.488	
5. Bankura	Lower Ganga plain (Deltaic part)	Laterite and alluvium	1320	29.30	2.07	1535	0.460	
6. Burdwan	Lower Ganga plain (Deltaic part)	Laterite and alluvium	1351	50.18	2.02	1802	0.473	
7. Nadia	Lower Ganga basin	Alluvium	1310	4.57	2.17	1357	0.477	
8. Birbhum	Lower Ganga plain (Deltaic part)	Laterite and alluvium	1285	44.28	4.01	1745	0.442	
9. Murshidabad	Lower Ganga basin (Deltaic part)	Alluvium	1349	14.68	3.47	1405	0.416	
10. West Dinajpur	Continuation of the north Bengal plain in the North and Barind tract in the South	Alluvium	1635	2.21	2.39	1235	0.468	
11. Cooch Behar	North Bengal plain	Old alluvium	3201	2.46	1.88	1351	0.442	
RAJASTHAN								
12. Nagaur	Mostly sandy desert plain	In North sandy, in South fertile light loamy	389	3.82	2.67	223	0.471	Water table generally 200' below
13. Jhunjhunun	A plain with sandy desert features	Sandy poor to sandy loamy	445	6.67	2.92	269	0.479	

1	2	3	4	5	6	7	8	9
14. Churu	Thar desert with sand dunes	Generally desert (gray & brown) soil	326	0.74	1.06	140	0.405	
15. Bikaner	Desert with sand dune topography	Generally desert (gray & brown) soil	264	0.20	- 1.91	62	0.448	No irrigation facilities
GUJARAT								
16. Kutch	Northern half-swampy and marshy, southern half is undulating plain	Fresh alluvium medium black and saline deltaic alluvium plain	332	22.23	4.62	683	0.447	
17. Banaskantha	Luni-Banas plain	Old alluvium	627	21.45	4.45	560	0.436	
18. Mahesana	Mostly plain	Old alluvium	609	34.94	4.76	958	0.489	Subsoil water is available for irrigation
19. Surat	Coastal plain	Deep black soil and coastal alluvium	1521	20.00	- 0.89	949	0.433	
20. Surendranagar	Dissected plateau fringed by a narrow coastal plain in the North	Thin sandy, thin poor red alluvial and medium black	507	8.75	1.54	508	0.418	Lack of irrigation facilities
*21. Amreli	Mostly hilly with an undulating plain in the Eastern part	Medium black but mostly poor for agriculture except in some parts	501	10.78	0.35	818	0.402	Lack of irrigation facilities
*22. Bhavnagar	Undulating plain	Vary from medium black clay alluvial to coastal sandy alluvial	593	13.47	1.61	714	0.409	Long breaks between two effective showers
*23. Panchmahals	Undulating plain	Medium black soil	988	5.78	0.64	942	0.435	
*24. Bharuch	Mostly plain with some hilly tract	In the West Khar and brown, in the Central part black and in Eastern part rocky	950	15.44	- 0.60	965	0.476	Lack of water for drinking and irrigation
*25. The Dangs	Mostly hilly with deep ravines difficult to access	Red to black soil; fertility is poor and lands are subjected to erosion	1999	0.62	- 4.95	611	0.418	
MADHYA PRADESH								
*26. Jhabua	Undulating plateau	Poor except areas where soil is black	828	3.60	- 5.96	441	0.459	
*27. Khargone (West Nimar)	Dissected Plateau with narrow valleys	Rich alluvial in river valleys, other than rocky	832	7.55	- 2.87	613	0.455	
*28. Khandwa (East Nimar)	Mostly hilly with narrow valleys of Tapi	Shallow rocky, alluvial in valleys	880	5.82	0.69	654	0.481	
*29. Sehore	Dissected Plateau	Deep and Medium black soil	1330	6.69	1.11	581	0.475	
MAHARASHTRA								
*30. Dhulia	Tapti Basin with bare ridges and hills	Deep medium black	674	12.82	- 5.02	479	0.437	

1	2	3	4	5	6	7	8	9
*31. Jalgaon	Denuded Plateau	Deep medium black	741	16.63	- 8.41	460	0.484	
*32. Aurangabad	Dissected Plateau	Light in North hilly in West and fertile in East	726	9.72	- 8.29	263	0.438	
*33. Bhir	Lava Plateau with hills in the Central part	In central part light and stony; fertile along banks; in South rich and in West poor soil with little rain	668	7.82	- 8.89	249	0.466	Low and unreliable rainfall
*34. Sholapur	Peneplaned surface	Deep black; light to medium light	584	14.30	- 8.48	301	0.488	All the talukas receive scarce rainfall
*35. Osmanabad	Dissected Plateau	Light to heavy black	810	10.12	- 7.41	329	0.436	
*36. Nanded	Denuded Plateau	Mostly black fertile	898	3.33	- 5.04	332	0.434	
*37. Parbhani	Peneplaned surface	In hilly track shallow and poor in South light and in Central Part heavy black	821	3.42	- 6.28	294	0.428	
*38. Yeotmal	Rugged topography	Alluvial to hilly	992	1.36	- 0.56	462	0.441	
*39. Wardha	Wardha river basin with hills	Hilly shallow, rich alluvial and fertile black	1090	2.85	- 0.37	406	0.475	
*40. Nagpur	Nagpur Basin and denuded Plateau	Kali deep to bardi (red gravel with boulders)	1176	7.86	- 1.43	392	0.479	
ORISSA								
*41. Kalahandi + Koraput	Rugged Eastern ghats with rolling topography and and eroded Plateau	Laterite and red with patches of black and brown	1450	3.76	- 0.30	992	0.477	Mostly tribal area
42. Keonjhar	Dissected flat topped Plateau	Red, Medium black soil	1535	4.40	- 0.75	934	0.392	
*43. Dhenkanal	Dissected and flat topped Plateau	Mostly red with patches of laterite and black	1535	4.27	0.50	1070	0.481	Mostly tribal area
*44. Sundargarh	Denuded Plateau rolling and undulating topography	Mostly sandy and laterite with red	1648	5.33	- 0.69	970	0.449	Mostly tribal area
*45. Mayurbhanj	Flat topped Plateau	Red with laterite	1648	1.21	- 1.31	888	0.470	Mostly tribal area
*46. Balasore	Coastal plain with some hillocks	Mostly light and sandy with laterite red and black	1568	15.47	- 0.47	891	0.459	Mostly tribal area
KARNATAKA								
*47. Gulbarga	Peneplaned Plateau	Deep and medium black	702	2.34	- 0.26	448	0.481	

1	2	3	4	5	6	7	8	9
*48. Bijapur	Denuded Plateau	Deep and medium black; mixed red and black	553	6.28	- 1.65	410	0.481	Scarcity and famine conditions are regular features
*49 Dharwar	Dissected Mysore Plateau	Red, laterite, mixed red and black soil	691	7.63	0.49	699	0.479	
*50. Raichur	Denuded Plateau with Raichur Doab	Black (deep and medium); mixed red and black soil	602	16.39	6.46	302	0.466	Canals are the main source of irrigation
51. Shimoga	Malnad Plateau	Rocky to alluvium and black	1526	63.67	5.56	1943	0.484	Sources of irrigation available
52. Mysore	Dissected Plateau	Red and deep black soil	762	25.68	4.00	1346	0.468	
KERALA								
53. Quilon	Undulating plain	Forest and hilly soil; laterite and alluvium	2760	53.03	1.23	1667	0.476	
54. Trivandrum	Coastal plain	Hilly and forest soil; laterite plus alluvium	2002	57.60	0.92	1772	0.486	
TAMIL NADU								
55. Kanyakumari	An Extension of the Western coastal plain	Red and new alluvium	1470	Not reliable	4.06	2796	0.480	
56. Salem + Dharmapuri	Denuded plateau and hills	Red soil with patches of medium black soil	843	36.73	1.08	1281	0.485	
57. North Arcot	Peneplaned Plateau interspersed with Javadi Hills	Red, laterite and and alluvium soil	971	65.92	1.31	1993	0.488	

APPENDIX V
Spatial Distribution of Clusters of Districts Arranged According to Four Gini Levels and their Agricultural Characteristics

PART I
Gini Ratio between 0.200-0.400

Cluster/ Isolated	State/District	Average agri- cultural pro- ductivity level (Rs/hectare for 1962-65 to 1970-73)	Average agricultural growth rate (1962-65 to 1970-73)	Population density (per- sons/hectare of gross crop- ped area for 1971)
1	2	3	4	5
With Gini Level 0.200-0.400 there is only a small cluster of districts spanning over the South-Western Gujarat and four isolated districts scattered over North India. Details are as below.				
Cluster	GUJARAT			
	1. Jamnagar	795	5.28	1.90
	2. Rajkot	863	1.04	2.38
	3. Junagadh	1308	3.11	2.97
Isolated Districts	PUNJAB			
	1. Bhatinda	1621	6.87	1.87
	UTTAR PRADESH			
	1. Meerut	2166	4.78	6.24
	WEST BENGAL			
	1. Purulia	1311	2.82	5.59
	ORISSA			
	1. Kconjhar	934	- 0.75	4.43

PART II
Gini Ratio between 0.401-0.500

1	2	3	4	5
With Gini Level 0.401-0.500, there is one very large cluster of districts spanning over Gujarat - Madhya Pradesh - Maharashtra - Karnataka. five smaller clusters and eight isolated districts scattered all over India. Details are as below.				
Cluster - 1	JAMMU & KASHMIR			
	Kashmir Valley (Baramula, Srinagar, Anantnag, Punch, Rajauri)	1506	5.44	8.71
Cluster - 2	RAJASTHAN			
	1. Bikaner	62	- 1.91	2.25
	2. Churu	140	1.06	1.74
	3. Jhunjhunun	269	2.92	3.30
	4. Sikar	349	2.72	3.18
	5. Nagaur	223	2.67	1.64
	6. Jaipur	653	4.71	3.56
Cluster - 3	GUJARAT - MADHYA PRADESH - MAHARASHTRA - KARNATAKA			
	GUJARAT			
	1. Amreli	878	0.35	1.81
	2. Bhavnagar	714	1.61	2.63
	3. Surendranagar	508	1.54	1.30
	4. Kutch	683	4.62	2.87
	5. Banaskantha	560	4.45	2.08

1	2	3	4	5
	6. Mahesana	958	4.76	3.40
	7. Sabarkantha	1097	2.48	2.68
	8. PanchMahals	942	0.64	4.11
	9. Vadodara	1250	0.03	4.44
	10. Bharuch	965	-0.60	3.07
	11. Surat	949	-0.89	5.37
	12. The Dangs	611	-4.95	5.87
	MADHYA PRADESH			
	1. Jhabua	441	-5.96	2.85
	2. Dhar	576	-0.61	2.03
	3. Khargone (West Nimar)	613	-2.87	2.37
	4. Khandwa (East Nimar)	654	0.69	2.44
	MAHARASHTRA			
	1. Dhulia	479	-5.02	2.95
	2. Jalgaon	460	-8.41	3.50
	3. Nasik	550	-2.75	4.12
	4. Aurangabad	263	-8.29	2.10
	5. Parbhani	294	-6.28	2.07
	6. Bhir	249	-8.89	2.15
	7. Sholapur	301	-8.48	2.57
	8. Osmanabad	329	-7.41	2.28
	9. Nanded	332	-5.04	2.20
	10. Yeotmal	462	-0.56	1.86
	11. Wardha	406	-0.37	1.89
	12. Nagpur	392	-1.43	3.81
	KARNATAKA			
	1. Bidar	719	-0.12	3.18
	2. Gulbarga	448	-0.26	1.91
	3. Bijapur	410	-1.65	1.92
	4. Raichur	802	6.64	1.66
	5. Bellary	1046	2.40	2.61
	6. Dharwar	699	0.49	2.53
	7. Shimoga	1943	5.56	5.01
Cluster-4	(KERALA-TAMIL NADU)			
	KERALA			
	1. Quilon	1667	1.23	42.98
	2. Trivandrum	1772	0.92	55.62
	TAMIL NADU			
	1. Kanyakumari	2796	4.06	19.03
Cluster-5	KARNATAKA-TAMIL NADU			
	1. Mysore	1346	4.00	5.70
	TAMIL NADU			
	1. Dharmapuri + Salem	1281	1.08	6.72
	2. North Arcot	1993	1.31	6.61
Cluster-6	ORISSA-WEST BENGAL			
	WEST BENGAL			
	1. Birbhum	1745	4.01	4.28
	2. Murshidabad	1405	3.47	5.39
	3. Nadia	1357	2.17	5.27
	4. Burdwan	1802	2.02	7.16
	5. Bankura	1535	2.07	5.02
	6. Hooghly	1983	4.25	10.27
	7. Howrah	1565	1.10	25.20
	8. Midnapore	1426	2.58	5.75
	ORISSA			
	1. Mayurbhanj	888	-1.31	3.91

1	2	3	4	5
	2. Balasore	891	-0.47	4.19
	3. Sundargarh	910	-0.69	4.59
	4. Dhenkanal	1070	0.50	3.45
	5. Bolangir	985	-0.88	3.61
	6. Kalahandi + Koraput	992	-0.30	3.51
Isolated Districts	PUNJAB			
	1. Sangrur	1724	7.37	2.06
	UTTAR PRADESH			
	1. Bulandshahr	1456	4.78	4.26
	RAJASTHAN			
	1. Barmer	179	7.20	0.72
	MADHYA PRADESH			
	1. Sehore	581	1.11	2.87
	2. Narsimhapur	824	1.08	2.74
	WEST BENGAL			
	1. West Dinajpur	1235	2.39	3.03
	2. Cooch Behar	1351	1.88	4.04
	ASSAM			
	1. Kamrup	1008	2.44	5.25

PART III
Gini Ratio between 0.501-0.600

1	2	3	4	5
With Gini Level 0.501-0.600, there are three very large clusters of districts spanning over (i) Jammu & Kashmir-Punjab-Haryana-Uttar Pradesh-Bihar, (ii) Rajasthan-Madhya Pradesh-Maharashtra (clusters (i) & (ii) meet together on the South Western boundary of Uttar Pradesh), (iii) Karnataka-Kerala-Tamil Nadu-Andhra Pradesh-Orissa; two smaller clusters and seven isolated districts scattered all over India. Details are as below.				
Cluster-1	JAMMU & KASHMIR-PUNJAB-HARYANA-UTTAR PRADESH-BIHAR			
	JAMMU & KASHMIR			
	1. Jammu Region (Doda, Udhampur, Jammu and Kathua districts)	862	5.67	3.94
	PUNJAB			
	1. Gurdaspur	1734	8.97	3.90
	2. Amritsar	1934	7.98	4.08
	3. Kapurthala	1921	9.34	3.32
	4. Jullundur	1856	7.46	4.34
	5. Firozpur	1839	7.14	2.11
	6. Ludhiana	2125	7.98	3.21
	7. Ropar	1354	7.00	3.53
	8. Patiala	1717	8.17	2.59
	RAJASTHAN			
	1. Ganganagar	818	8.54	1.34
	HARYANA			
	1. Ambala	1362	6.41	3.90
	2. Karnal	1756	8.30	2.44
	3. Jind	1071	5.17	1.90
	4. Hisar	968	4.16	1.51
	5. Mahendragarh	548	5.52	1.88
	6. Rohtak	1250	3.71	2.77
	7. Gurgaon	937	5.56	3.24
	UTTAR PRADESH			
	1. Dehra Dun	1227	3.45	9.33

1	2	3	4	5
	2. Muzaffarnagar	2540	5.52	4.65
	3. Bijnor	1792	4.43	4.17
	4. Moradabad	1229	3.86	4.28
	5. Rampur	1128	2.00	3.69
	6. Naini Tal	1612	6.53	3.19
	7. Pilibhit	1263	2.96	2.94
	8. Bareilly	1129	1.02	4.65
	9. Budaun	978	2.14	3.61
	10. Aligarh	1198	6.47	4.13
	11. Mathura	1110	4.67	3.61
	12. Agra	851	2.17	5.74
	13. Etah	1019	2.70	4.05
	14. Mainpuri	967	2.43	4.30
	15. Farrukhabad	1008	1.33	4.49
	16. Shahjahanpur	1060	2.97	3.76
	17. Kheri	1187	0.54	3.09
	18. Bahraich	618	1.86	3.07
	19. Gonda	794	1.28	3.90
	20. Bara Banki	997	0.10	4.53
	21. Lucknow	867	1.78	10.13
	22. Sitapur	1011	0.63	4.07
	23. Hardoi	1018	2.85	3.91
	24. Unnao	918	4.41	3.96
	25. Kanpur	1063	2.97	6.21
	26. Etawah	1082	3.08	4.20
	27. Jalaun	748	1.04	2.39
	28. Hamirpur	740	3.70	2.01
	29. Banda	745	2.77	2.16
	30. Fatehpur	999	1.88	4.10
	31. Rae Bareli	911	3.41	4.71
	32. Pratapgarh	801	0.48	5.59
	33. Sultanpur	890	1.54	4.78
	34. Faizabad	1064	1.50	5.84
	35. Basti	996	2.66	4.53
	36. Gorakhpur	1069	2.69	5.72
	37. Deoria	1273	2.25	5.41
	38. Azamgarh	975	0.86	6.07
	39. Jaunpur	981	1.13	6.04
	40. Varanasi	932	-0.84	8.17
	BIHAR			
	1. Saran	1239	3.77	7.42
	2. Patna	1286	0.92	9.19
	3. Darbhanga	955	0.49	8.20
Cluster-2	RAJASTHAN-MADHYA PRADESH- MAHARASHTRA			
	RAJASTHAN			
	1. Jaisalmer	52	-9.89	1.39
	2. Jodhpur	231	10.76	1.49
	3. Jalor	424	9.58	1.31
	4. Sirohi	597	4.61	3.19
	5. Dungarpur	729	0.48	3.96
	6. Banswara	857	1.67	3.01
	7. Chittaurgarh	837	5.68	2.62
	8. Bhilwara	664	3.67	2.92
	9. Tonk	456	1.00	1.46
	10. Sawai Madhopur	696	3.88	2.33
	11. Bharatpur	906	6.20	2.44
	12. Bundi	799	6.09	1.90
	13. Kota	659	4.44	2.16
	14. Jhalawar	553	1.17	2.09

1	2	3	4	5
	MADHYA PRADESH			
	1. Mandsaur	697	2.80	2.30
	2. Ratlam	570	0.47	2.60
	3. Ujjain	668	2.95	2.23
	4. Indore	714	4.26	4.85
	5. Dewas	662	0.81	2.04
	6. Shajapur	716	2.29	1.96
	7. Rajgarh	557	1.55	1.97
	8. Guna	523	2.33	1.69
	9. Shivpuri	581	-0.11	2.39
	10. Morena	742	3.40	2.57
	11. Bhind	835	3.13	2.56
	12. Datia	555	2.35	2.07
	13. Tikamgarh	778	3.82	3.29
	14. Chhatarpur	677	1.56	2.85
	15. Panna	556	1.96	2.20
	16. Damoh	576	1.93	2.35
	17. Sagar	605	3.33	2.71
	18. Vidisha	587	1.87	1.60
	19. Raisen	610	1.38	1.97
	20. Hoshangabad	593	1.15	2.33
	21. Betul	598	-0.28	2.58
	22. Chhindwara	677	0.11	2.90
	23. Seoni	695	1.84	2.61
	24. Mandla	685	2.51	3.32
	25. Balaghat	975	2.04	3.25
	26. Durg	755	0.88	2.97
	27. Bastar	847	1.11	2.92
	UTTAR PRADESH			
	1. Jhansi	655	2.33	2.87
	MAHARASHTRA			
	1. Amravati	386	-5.23	2.27
	2. Buldhana	375	-4.09	2.02
	3. Akola	362	-3.43	2.02
	4. Chandrapur	557	-0.67	2.66
	ANDHRA PRADESH			
	1. Adilabad	474	-0.89	2.66
Cluster-3	MAHARASHTRA-KARNATAKA			
	MAHARASHTRA			
	1. Ahmadnagar	543	-5.29	2.43
	2. Poona	431	-5.04	4.70
	3. Satara	676	-2.72	3.69
	4. Sangli	681	-5.21	3.78
	5. Kolhapur	2272	1.26	7.14
	KANARTAKA			
	1. Belgaum	1027	0.99	3.39
Cluster-4	KARNATAKA-KERALA- TAMIL NADU-ANDHRA PRADESH-ORISSA			
	KARNATAKA			
	1. South Kanara	1648	-1.06	11.79
	2. Chikmagalur	1390	3.28	5.86
	3. Chitradurga	1152	6.91	3.98
	4. Tumkur	1235	4.53	5.71
	5. Kolar	1429	1.14	7.83
	6. Bangalore	1074	1.16	11.90
	7. Mandya	2278	1.92	6.09
	8. Hassan	1147	0.59	5.42
	9. Coorg	1963	-0.36	7.68

1	2	3	4	5
KERALA				
1. Kozhikode + Malappuram + Palghat + Kottayam + Ernakulam	1814			
2. Trichur	1640	2.78		19.64
3. Alleppey	2071	1.49		18.34
		2.35		22.40
TAMIL NADU				
1. Coimbatore	1796			
2. Madurai	1722	0.33		6.92
3. Ramanathapuram	1087	1.97		7.99
4. Thanjavur	2371	0.88		5.85
5. Tiruchirapalli	1522	4.64		5.30
6. South Arcot	2163	1.91		5.83
7. Chingleput	1883	5.01		5.56
		3.39		6.59
ANDHRA PRADESH				
1. Chittoor	1909			
2. Anantapur	852	2.82		5.26
3. Cuddapah	856	-1.52		3.66
4. Nellore + Guntur + Kurnool + Ongole	1120	-1.26		4.62
5. Mahbubnagar	465	0.74		4.07
6. Hyderabad	491	-1.82		2.51
7. Nalgonda	623	-3.72		10.97
8. Khammam	745	1.22		2.42
9. Krishna	1777	-0.14		4.00
10. Visakhapatnam + Srikakulam	1467	0.61		5.29
		-0.29		6.26
ORISSA				
1. Ganjam	1163			
2. Puri + Cuttack	1077	0.42		5.28
		-0.59		5.40
Cluster-5 WEST BENGAL—ASSAM				
WEST BENGAL				
1. Jalpaiguri	1371		2.62	
				5.52
ASSAM				
1. Goalpara	1056			
2. Nowgong	1246	2.71		5.14
3. Darrang	1278	1.45		5.88
4. Lakhimpur	1351	1.55		5.59
		4.29		7.73
Isolated Districts MADHYA PRADESH				
1. Surguja	741		1.02	
				3.29
GUJARAT				
1. Kheda	1830		3.47	
2. Valsad	1138		-1.63	5.08
				9.38
ORISSA				
1. Sambalpur	1133		0.51	
				3.14
BIHAR				
1. Santal Parganas	979		-2.39	
				6.09
WEST BENGAL				
1. Malda	1125		3.07	
2. 24-Parganas	1315		-0.08	4.87
				12.08

PART IV
Gini Ratio 0.601 and above

1	2	3	4	5
With Gini Level 0.601 and above, there is one large cluster which spans over Uttar Pradesh—Madhya Pradesh—Bihar, three small clusters and twelve isolated districts scattered all over India. The details are as below.				
Cluster-1 UTTAR PRADESH—MADHYA PRADESH—BIHAR				
UTTAR PRADESH				
1. Allahabad	857		1.74	5.52
2. Mirzapur	768		0.49	4.23
3. Ghazipur	923		3.55	4.74
4. Ballia	990		1.90	6.35
MADHYA PRADESH				
1. Rewa	542		2.71	2.88
2. Sidhi	485		3.97	2.81
3. Satna	548		2.88	2.77
4. Jabalpur	595		1.01	3.85
5. Shahdol	640		2.59	2.98
6. Bilaspur	963		2.10	3.22
7. Raigarh	818		0.27	3.28
8. Raipur	1093		0.27	3.10
BIHAR				
1. Champaran	1128		3.19	4.76
2. Muzaffarpur	869		N.A.	8.39
3. Monghyr + Saharsa	801		-0.39	7.38
4. Purnea	786		-2.29	5.08
5. Bhagalpur	1141		2.87	6.74
6. Hazaribagh + Dhanbad	813		-3.75	5.63
7. Gaya	1058		-0.85	6.69
8. Palamau	658		-0.27	5.83
9. Ranchi	806		1.55	4.75
10. Singhbhum	993		-0.51	6.45
Cluster-2 RAJASTHAN				
1. Ajmer	414		2.63	2.95
2. Pali	421		6.76	1.94
3. Udaipur	806		1.63	4.47
Cluster-3 MAHARASHTRA				
1. Thana	1399		-2.52	13.40
2. Kolaba	1528		0.31	7.94
3. Ratnagiri	1144		1.34	10.38
Cluster-4 ANDHRA PRADESH				
1. Nizamabad	1298		-4.47	5.01
2. Medak	640		-5.32	4.55
3. Karimnagar	813		-0.57	5.35
4. Warangal	750		0.37	4.61
Isolated Districts PUNJAB				
1. Hoshiarpur	1268		7.41	3.44
UTTAR PRADESH				
1. Saharanpur	1762		3.84	4.59
RAJASTHAN				
1. Alwar	820		7.38	2.30
MADHYA PRADESH				
1. Gwalior	746		-0.85	3.86
GUJARAT				
1. Ahmedabad	871		0.85	5.72

1	2	3	4	5
	KARNATAKA			
	1. North Kanara	1699	- 0.26	9.28
	KERALA			
	1. Cannanore	1511	0.90	23.50
	TAMIL NADU			
	1. Tirunelveli	1551	1.38	8.41
	ANDHRA PRADESH			
	1. East Godavari	1839	- 0.85	7.53
	2. West Godavari	2519	1.53	5.57
	ASSAM			
	1. Sibsagar	1492	0.34	26.24
	2. Cachar	1412	1.27	8.22

Agricultural Production Performances of Selected 275 Districts Arranged According to Natural Regions and Sub-regions and According to Gini Concentration Ratios of Land Ownership, 1971

APPENDIX VI

Sl. No	Region	Sub-region	Gini Level (1971)	Name of District	No. of Districts	Main food grain crops	Average agricultural growth rate (1962-65 to 1970-73)	Mean Productivity (per hectare in Rs.) (1970-73)	Average food production (per hectare of gross cropped area of nine food crops in kg.)	Average food surplus (per hectare of gross cropped area of nine food crops in kg.)	Average food deficit (per hectare of gross cropped area of nine food crops in kg.)	Net food surplus/deficit (per hectare of gross cropped area of nine food crops in kg.)	Average NPK fertilizer per hectare of total gross cropped area (kg.)	Percent irrigated area to gross cropped area of all crops
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Himalayas	West Himalayas	0.464-0.489	Kashmir Valley	1	Rice & Maize	5.44	1,506	1,549	122	—	122	13.1	66.22
			0.542-0.567	Jammu Region	1	Wheat & Maize	5.67	862	1,010	389	—	389	6.2	25.22
			0.568-0.593	Naini Tal	1	Wheat & Rice	6.53	1,612	1,279	651	—	651	50.9	43.57
			0.594-0.619	Dehra Dun	1	Wheat & Rice	3.45	1,227	1,046	—	562	—562	24.3	43.40
Total of Sub-region			0.464-0.619		4	Rice & Wheat	5.27	1,302	1,235	335	32	303	19.8	43.09
2.	Northern Plains	Rajasthan Plains	0.386-0.411	Churu	1	Bajra	1.06	140	189	—	72	—72	Neg.	0.10
			0.438-0.463	Bikaner	1	Bajra	- 1.91	62	78	—	270	—270	0.1	1.47
			0.464-0.489	Nagaur	1	Bajra	2.67	223	284	7	—	7	0.3	3.82
			0.490-0.515	Barmer, Ganganagar	2	Bajra, Gram & Wheat	7.87	497	464	294	—	294	6.7	31.75
			0.516-0.541	Jalor	1	Bajra	9.58	424	546	324	—	324	0.5	14.37
			0.542-0.567	Jaisalmer, Jodhpur	2	Bajra	0.44	142	267	49	19	30	0.7	3.73
			0.594-0.619	Pali	1	Bajra & Jowar	6.76	421	582	172	—	172	2.1	21.66
Total of Sub-region			0.386-0.619		9	Bajra	3.86	283	376	164	24	140	2.9	16.58
	Punjab Plains		0.360-0.385	Bhatinda	1	Wheat	7.87	1,621	1,632	1,236	—	1,236	34.5	94.54
			0.490-0.515	Amritsar, Ludhiana Sangrur, Jind, Mahendragarh	5	Wheat & Bajra	6.80	1,480	2,201	1,320	—	1,320	48.4	85.22
			0.516-0.541	Karnal, Rohtak, Patiala, Hisar	4	Wheat	6.09	1,423	1,319	948	—	948	25.8	65.50
			0.542-0.567	Kapurthala, Firozpur, Jullundur	3	Wheat	7.98	1,872	1,987	1,451	—	1,451	61.4	Not reliable

1	2	3.	4	5	6	7	8	9	* 10	* 11	12	13	14	15
			0.464-0.489	Hooghly, Nadia, West Dinajpur, Burdwan	4	Rice	2.73	1,594	1,298	266	8	258	16.4	24.31
			0.490-0.515	Midnapore	1	Rice	2.58	1,426	1,220	328	—	328	8.2	11.49
			0.516-0.541	Malda, 24-Parganas	2	Rice	1.50	1,220	1,082	61	625	—	10.6	4.28
			0.594-0.619	Jalpaiguri	1	Rice	2.62	1,371	1,163	153	—	153	3.7	1.43
Total of Sub-region			0.360-0.619		14	Rice	2.46	1,466	1,248	302	150	152	12.1	16.54
		Assam Valley	0.490-0.515	Nowgong, Kamrup	2	Rice	1.95	1,127	872	—	115	—	2.6	9.90
			0.516-0.541	Goalpara	1	Rice	2.71	1,056	848	—	61	—	1.8	11.90
			0.542-0.567	Lakhimpur, Darrang	2	Rice	2.92	1,315	1,108	37	69	—	4.1	16.33
			0.594-0.619	Sibsagar	1	Rice	0.34	1,492	1,222	103	—	103	5.1	0.22
			0.646-0.671	Cachar	1	Rice	1.27	1,412	1,193	—	85	—	5.9	1.07
Total of Sub-region			0.490-0.671		7	Rice	2.01	1,263	1,002	22	77	—	3.4	9.90
3. Central Hills & Plateaus		Central Hills & Plateaus	0.438-0.463	Jhabua, Khargone (West Nimar)	2	Jowar & Maize	— 4.42	527	543	22	57	—	15	6.3
			0.464-0.489	Khandwa (East Nimar), Sehore, Jhuinjunun	3	Wheat, Jowar & Bajra	1.57	501	615	129	51	78	9.1	6.3
			0.490-0.515	Narsimhapur, Tikamgarh, Morena, Raisen, Bharatpur, Dungarpur, Bhilwara, Shivपुर, Dhar, Sikar, Jaipur	11	Bajra Wheat, Jowar & Bajra	2.43	674	778	287	4	283	6.1	23.7
			0.516-0.541	Bhind, Shajapur, Indore, Mandasaur, Ujjain, Dewas, Chittaurgarh, Bundi, Kota, Jhalawar, Vidisha, Ratlam, Rajgarh, Datia, Guna, Jhansi Gurgaon, Surguja, Chhatrapur, Chhindwara, Betul, Hoshangabad, Panna, Tonk, Banswara, Jalaun, Hamirpur Banda, Bastar, Seoni, Mandla, Sagar, Sirohi, Sawai Madhopur Balaghat, Bilaspur, Raigarh, Durg, Shahdol, Jabalpur, Damoh Udaipur, Ajmer, Satma, Sidhi	16	Wheat & Jowar	2.78	662	786	374	1	373	9.1	15.1
			0.542-0.567		11	Wheat	1.68	689	787	346	—	346	5.5	16.4
			0.568-0.593		7	Wheat & Rice	2.86	696	766	329	—	329	2.8	11.9
			0.594-0.619		7	Rice	1.55	760	752	221	1	220	8.0	12.7
			0.620-0.645		4	Wheat, Rice & Maize	2.78	563	736	152	—	152	3.5	16.5
			0.646-0.671	Raipur, Gwalior, Rewa, Mirzapur	4	Rice & Wheat	1.14	787	859	293	—	293	12.6	23.1
Total of Sub-region			0.438-0.671		65	Wheat, Rice & Jowar	2.03	673	768	291	4	287	7.1	16.0

POPULATION, FOOD AND LAND INEQUALITY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Central Hills & Plateaus of Bihar and Orissa	0.386-0.411	Keonjhar	1	Rice	-0.75	934	782	73	—	73	—	73	1.6	4.40
	0.438-0.463	Sundargarh	1	Rice	-0.69	910	784	62	—	62	—	62	2.0	5.33
	0.464-0.489	Kalahandi + Koraput, Dhenkanal, Mayurbhanj	3	Rice	-0.37	983	812	267	—	267	—	267	2.0	3.31
	0.490-0.515	Bolangir	1	Rice	-0.88	985	811	208	—	208	—	208	3.7	23.47
	0.516-0.541	Sambalpur, Ganjam	2	Rice	0.47	1,148	963	300	—	300	—	300	22.2	40.69
	0.568-0.593	Santal Parganas	1	Rice	-2.39	979	887	—	49	—	49	—	5.4	11.06
	0.594-0.619	Ranchi	1	Rice	1.55	806	716	—	8	—	8	—	5.2	4.72
	0.620-0.645	Dhanbad + Hazaribagh, Singbhum	2	Rice	-2.13	903	812	—	559	—	559	—	2.4	6.70
	0.646-0.671	Palamau	1	Rice	-0.27	658	666	—	337	—	337	—	2.0	28.03
	0.386-0.671		13	Rice	-0.61	948	828	149	102	47	6.5	14.04		
Total of Sub-region														
4. The Deccan Maharashtra and Andhra Pradesh Deccan	0.412-0.437	Dhulia, Parbhani, Nanded, Osmanabad	4	Jowar & Bajra	-5.94	358	305	—	216	—	216	—	10.8	7.34
	0.438-0.463	Ycotal, Aurangabad	2	Jowar	-4.43	363	306	—	170	—	170	—	8.5	5.96
	0.464-0.489	Jalgaon, Nagpur, Wardha, Bhir, Sholapur	5	Jowar	-5.52	362	307	—	279	—	279	—	14.1	10.82
	0.490-0.515	Nasik, Akola, Ahmednagar	3	Jowar & Bajra	-3.82	485	297	—	241	—	241	—	14.0	12.66
	0.516-0.541	Buldhana, Amravati, Chandrapur	3	Jowar & Rice	-3.33	439	487	25	139	—	139	—	10.5	7.72
	0.542-0.567	Poona, Adilabad, Mahbubnagar, Chittoor	4	Jowar & Rice	-1.23	820	528	—	255	—	255	—	13.7	20.52
	0.568-0.593	Satara, Sangli, Hyderabad, Khammam, Nalgonda, Cuddapah, Anantapur	7	Jowar	-1.91	703	585	15	318	—	318	—	17.7	24.80
	0.594-0.619	Kolhapur, Nizamabadi, Medak	3	Rice & Jowar	-2.84	1403	773	4	296	—	296	—	34.8	29.51
	0.620-0.645	Karimnagar, Warangal	2	Jowar	-0.10	782	831	—	112	—	112	—	24.7	34.38
	0.412-0.645		33	Jowar	-3.29	628	444	5	241	—	241	—	14.7	15.16
Total of Sub-region														
Karnataka and Tamil nadu Deccan	0.464-0.489	Dharwar, Gulbarga, Bijapur, Raichur, Shimoga, Mysore, North Arcot, Dharmapuri + Salem	8	Jowar & Rice	2.15	1,115	880	157	63	94	16.5	21.13		
	0.490-0.515	Bidar, Bellary, Chitradurga, Mandya, Bangalore, Kolar, Hassan	7	Ragi & Jowar	2.00	1,264	1,170	266	137	129	40.2	27.23		
	0.516-0.541	Coimbatore	1	Rice & Jowar	0.33	1,796	1,123	1	—	1	72.5	55.31		
	0.542-0.567	Belgaum, Tumkur, Chikmagalur, Madurai	4	Rice & Ragi	2.69	1,344	1,190	78	59	19	28.8	30.25		
	0.568-0.593	Coorg	1	Rice	-0.36	1,963	1,729	544	—	544	67.6	26.04		
	0.464-0.593		21	Rice, Ragi & Jowar	2.00	1,281	1,014	161	74	87	27.0	26.04		
	0.360-0.385	Rajkot, Jamnagar	2	Jowar & Bajra	3.16	829	599	—	320	—	320	26.1	14.47	
	0.386-0.411	Amreli, Bhavnagar	2	Bajra	0.98	796	706	48	46	2	28.2	12.21		
	0.412-0.437	Banaskantha, Surendranagar, Kutch	3	Bajra & Jowar	3.54	584	561	182	49	133	5.8	16.28		
	0.464-0.489	Mahesana	1	Bajra & Jowar	4.76	958	897	200	—	200	13.7	34.94		
Total of Sub-region														
5. West Coast Plains Kathiawar	0.490-0.515	Sabar Kantha	1	Maize & Bajra	2.48	1,097	1,056	276	—	276	16.5	16.38		
	0.360-0.515		9	Bajra & Jowar	2.90	784	694	138	82	56	17.6	17.34		
	0.412-0.437	Panch Mahals, The Dangs	2	Maize & Ragi	-2.16	777	1,039	261	8	253	6.3	5.73		
	0.464-0.489	Bharuch, Surat	2	Jowar	-0.75	957	764	620	—	620	24.6	17.63		
	0.490-0.515	Vadodara	1	Rice & Jowar	0.03	1,250	826	1173	—	1173	40.3	22.45		
	0.516-0.541	Kheda	1	Bajra & Jowar	3.47	1,830	1,162	43	—	43	46.3	31.19		
	0.568-0.593	Valsad	1	Rice	-1.63	1,138	933	700	—	700	32.8	26.39		
	0.594-0.619	Ahmadabad	1	Bajra & Jowar	0.85	871	696	—	972	—	972	16.7	18.47	
	0.412-0.619		8	Jowar, Rice, Maize, Bajra & Ragi	-0.39	1,070	919	64	478	—	414	26.9	19.41	
	0.620-0.645	Kolaba	1	Rice	0.31	1,528	1,362	146	—	146	36.1	3.27		
Total of Sub-region														
Konkan Coastal Lowland	0.646-0.671	Thana, Ratnagiri	2	Rice	-0.59	1,272	1,152	671	—	671	—	30.5	5.56	
	0.620-0.671		3	Rice	-0.29	1,357	1,217	45	465	—	420	32.2	4.86	
	0.516-0.541	South Kanara	1	Rice	-1.06	1,648	1,337	—	474	—	474	65.0	57.67	
	0.620-0.645	North Kanara	1	Rice	-0.26	1,699	1,381	332	—	332	14.0	23.68		
	0.516-0.645		2	Rice	-0.66	1,674	1,352	117	306	—	189	46.8	45.22	
	0.412-0.619		8	Jowar, Rice, Maize, Bajra & Ragi	-0.39	1,070	919	64	478	—	414	26.9	19.41	
	0.620-0.645	Kolaba	1	Rice	0.31	1,528	1,362	146	—	146	36.1	3.27		
	0.646-0.671	Thana, Ratnagiri	2	Rice	-0.59	1,272	1,152	671	—	671	—	30.5	5.56	
	0.620-0.671		3	Rice	-0.29	1,357	1,217	45	465	—	420	32.2	4.86	
	0.516-0.541	South Kanara	1	Rice	-1.06	1,648	1,337	—	474	—	474	65.0	57.67	
Total of Sub-region														
Konkan Kerala Transition	0.620-0.645	North Kanara	1	Rice	-0.26	1,699	1,381	332	—	332	14.0	23.68		
	0.516-0.645		2	Rice	-0.66	1,674	1,352	117	306	—	189	46.8	45.22	
	0.412-0.619		8	Jowar, Rice, Maize, Bajra & Ragi	-0.39	1,070	919	64	478	—	414	26.9	19.41	
	0.620-0.645	Kolaba	1	Rice	0.31	1,528	1,362	146	—	146	36.1	3.27		
	0.646-0.671	Thana, Ratnagiri	2	Rice	-0.59	1,272	1,152	671	—	671	—	30.5	5.56	
	0.620-0.671		3	Rice	-0.29	1,357	1,217	45	465	—	420	32.2	4.86	
	0.516-0.541	South Kanara	1	Rice	-1.06	1,648	1,337	—	474	—	474	65.0	57.67	
	0.620-0.645	North Kanara	1	Rice	-0.26	1,699	1,381	332	—	332	14.0	23.68		
	0.516-0.645		2	Rice	-0.66	1,674	1,352	117	306	—	189	46.8	45.22	
	0.412-0.619		8	Jowar, Rice, Maize, Bajra & Ragi	-0.39	1,070	919	64	478	—	414	26.9	19.41	
Total of Sub-region														

APPENDIX VI

APPENDIX VII

I. Agricultural Productivity Level Rs. 1,600 and above (40 Districts)

Size Class (hectares)	Total of Holdings	Per cent of Holding	Cuml. per cent of Holding (X_i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y_i)	Gini-Ratios	
							$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9
> 0.5	3,568,823	39.832	39.832	1,035,809	02.833	02.833	307.423	164.994
0.5- 1.0	1,649,272	18.408	58.240	1,785,653	04.885	07.718	1102.541	588.011
1.0- 2.0	1,608,016	17.947	76.187	4,099,286	11.213	18.931	2279.058	1633.234
2.0- 3.0	903,690	10.086	86.273	4,015,027	10.983	29.914	3441.603	2711.854
3.0- 4.0	392,639	04.382	90.655	3,647,775	09.978	39.892	4392.416	3726.352
4.0- 5.0	246,968	02.756	93.411	3,129,401	08.560	48.452	7061.124	4775.623
5.0-10.0	461,724	05.153	98.564	9,921,602	27.140	75.592	9152.653	7541.663
10.0-20.0	107,911	01.204	99.768	6,312,520	17.268	92.860	9661.832	9279.221
20.0-30.0	14,207	00.159	99.927	1,456,188	03.983	96.843	9827.021	9681.298
30.0-40.0	3,761	00.042	99.969	547,869	01.499	98.342	9893.632	9832.528
40.0-50.0	1,221	00.014	99.983	228,323	00.625	98.967	9998.200	9896.502
50.0 +	1,355	00.015	99.998	377,364	01.032	99.999	—	—
Total	8,959,587			36,556,817			67117.503	59831.280

Gini ratio = $7286.223/100 \times 100$
= 0.729

II. Agricultural Productivity Level Rs. 1,400-1,600 (15 Districts)

Size Class (hectares)	Total of Holding	Per cent of Holding	Cuml. per cent of Holding (X_i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y_i)	Gini-Ratios	
							X_i	Y_i
1	2	3	4	5	6	7	8	9
> 0.5	1,964,900	41.861	41.861	551,678	08.691	08.691	916.756	554.147
0.5- 1.0	1,027,961	21.900	63.761	838,519	13.209	21.900	2770.224	1819.233
1.0- 2.0	906,318	19.309	83.070	1,367,789	21.547	43.447	4845.058	3956.762
2.0- 3.0	375,537	08.001	91.071	944,482	14.878	58.325	6152.757	5515.154
3.0- 4.0	163,737	03.488	94.559	586,268	09.235	67.560	7090.507	6530.958
4.0- 5.0	99,028	02.110	96.669	471,316	07.425	74.985	8513.445	7445.486
5.0-10.0	123,178	02.624	99.293	830,535	13.083	88.068	9292.137	8794.030
10.0-20.0	26,378	00.562	99.855	350,100	05.515	93.583	9497.309	9352.779
20.0-30.0	4,047	00.086	99.941	96,976	01.528	95.111	9574.448	9508.056
30.0-40.0	1,266	00.027	99.968	43,774	00.690	95.801	9610.324	9577.992
40.0-50.0	473	00.010	99.978	21,129	00.333	96.134	9997.800	9613.304
50.0 +	999	00.021	99.999	245,445	03.866	100.000	—	—
Total	4,693,822			6,348,011			78260.765	72667.901
							Gini ratio= $\frac{5592.864}{100} \times 100$	
							= 0.559	

III. Agricultural Productivity Level Rs. 1,200-1,400 (26 Districts)

Size Class (hectares)	Total of Holding	Per cent of Holding	Cuml. per cent of Holding (X _i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y _i)	Gini-Ratios X _i Y _{i+1} X _{i+1} Y _i	
1	2	3	4	5	6	7	8	9
< 0.5	1,865,985	33.579	33.579	1,034,236	02.041	02.041	215.342	110.812
0.5- 1.0	1,151,111	20.714	54.293	2,215,875	04.372	06.413	916.792	487.260
1.0- 2.0	1,205,177	21.687	75.980	5,308,032	10.473	16.886	2072.127	1450.896
2.0- 3.0	552,525	09.943	85.923	5,263,873	10.386	27.272	3154.319	2483.007
3.0- 4.0	284,667	05.123	91.046	4,783,877	09.439	36.711	4125.567	3454.065
4.0- 5.0	169,048	03.042	94.088	4,359,343	08.602	45.313	6944.165	4467.862
5.0-10.0	250,723	04.512	98.600	14,440,123	28.492	73.805	9119.415	7365.887
10.0-20.0	66,779	01.202	99.802	9,469,195	18.684	92.489	9658.339	9243.166
20.0-30.0	7,547	00.136	99.938	2,172,130	04.286	96.775	9798.321	9674.597
30.0-40.0	1,780	00.032	99.970	643,205	01.269	98.044	9869.238	9802.537
40.0-50.0	621	00.011	99.981	343,404	00.678	98.722	9998.100	9872.299
50.0 +	1,098	00.020	100.001	647,601	01.278	100.000	—	—
Total	5,557,061			50,680,894			65871.725	58412.388

Gini ratio = $7459.337/100 \times 100$
= 0.746

IV. Agricultural Productivity Level Rs. 974-1,200 (49 Districts)

Size Class (hectares)	Total of Holding	Per cent of Holding	Cuml. per cent of Holding (X _i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y _i)	Gini-Ratios X _i Y _{i+1} X _{i+1} Y _i	
1	2	3	4	5	6	7	8	9
< 0.5	6,192,118	38.715	38.715	1,506,724	03.247	03.247	343.673	189.615
0.5- 1.0	3,147,908	19.682	58.397	2,612,469	05.630	08.877	1230.366	696.747
1.0- 2.0	3,213,547	20.092	78.489	5,657,430	12.192	21.069	2432.217	1824.007
2.0- 3.0	1,292,887	08.084	86.573	4,602,484	09.919	30.988	3443.355	2824.990
3.0- 4.0	7,342,312	04.591	91.164	4,076,998	08.786	39.774	4319.624	3737.006
4.0- 5.0	446,564	02.792	93.956	3,530,482	07.609	47.383	6785.502	4664.525
5.0-10.0	717,586	04.487	98.443	11,524,509	24.837	72.220	8985.089	7200.840
10.0-20.0	202,214	01.264	99.707	8,840,207	19.052	91.272	9602.183	9117.434
20.0-30.0	29,827	00.186	99.893	2,335,106	05.032	96.304	9788.016	9625.777
30.0-40.0	9,458	00.059	99.952	780,082	01.681	97.985	9869.260	9795.854
40.0-50.0	3,327	00.021	99.973	350,212	00.755	98.740	9997.300	9874.000
50.0 +	4,349	00.027	100.000	584,752	01.260	100.000	—	—
Total	15,994,016			46,401,455			66796.585	59550.795

Gini ratio = $7245.790/100 \times 100$
= 0.725

V. Agricultural Productivity Level Rs. 600-974 (92 Districts)

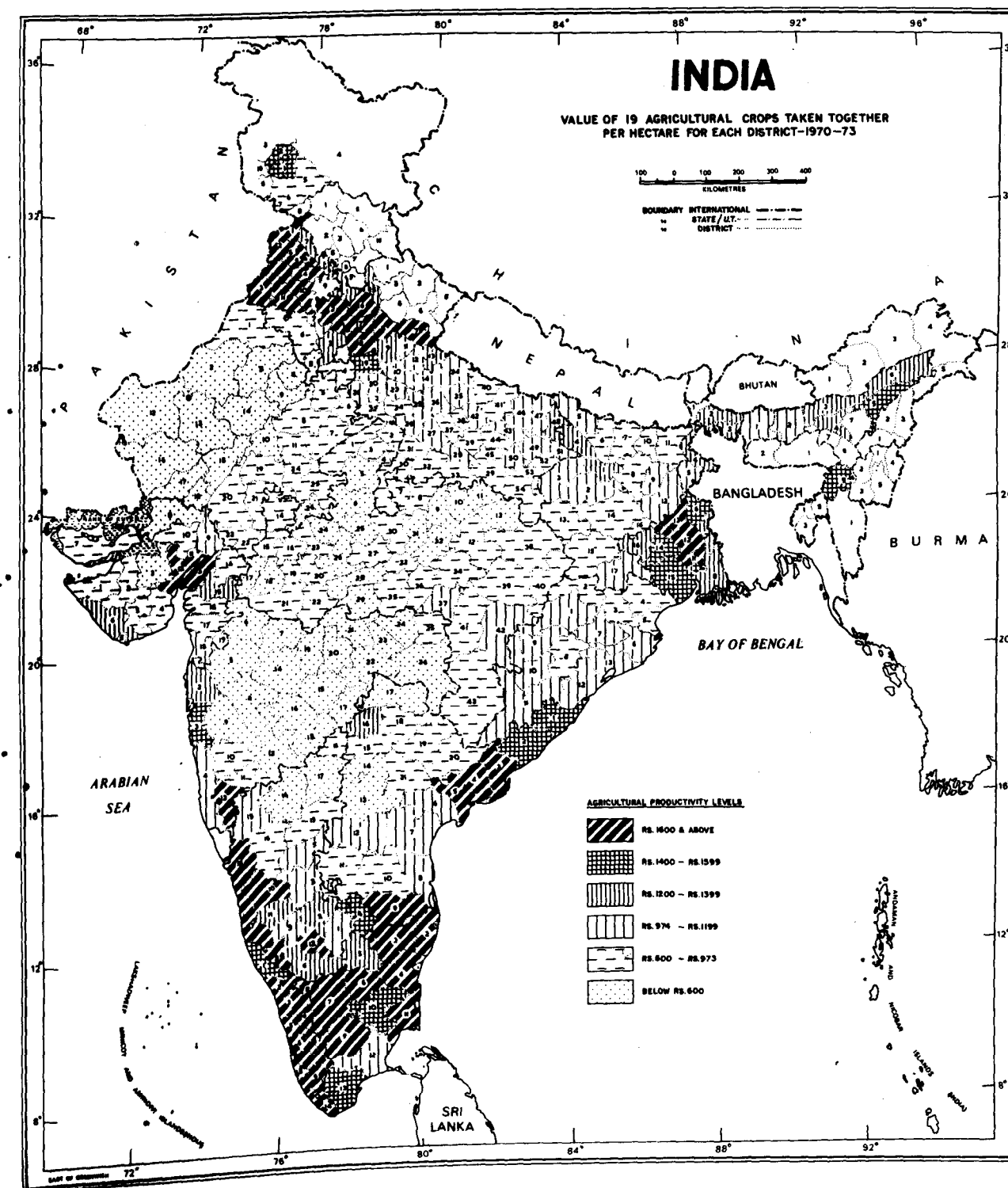
Size Class (hectares)	Total of Holding	Per cent of Holding	Cuml. per cent of Holding (X _i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y _i)	Gini-Ratios X _i Y _{i+1} X _{i+1} Y _i	
1	2	3	4	5	6	7	8	9
< 0.5	5,062,782	29.036	29.036	1,958,695	01.258	01.258	121.893	56.965
0.5- 1.0	2,832,788	16.246	45.282	4,576,735	02.940	04.198	531.882	268.336
1.0- 2.0	3,249,865	18.638	63.920	11,750,777	07.548	11.746	1290.673	871.753
2.0- 3.0	1,795,359	10.297	74.217	13,148,798	08.446	20.192	2103.681	1633.371
3.0- 4.0	1,163,820	06.675	80.892	12,693,611	08.153	28.345	2913.002	2423.838
4.0- 5.0	805,497	04.620	85.512	11,935,780	07.666	36.011	5537.244	3425.942
5.0-10.0	1,678,092	09.624	95.136	44,748,783	28.743	64.754	8355.129	6412.200
10.0-20.0	677,857	03.888	99.024	35,916,167	23.069	87.823	9398.566	8754.372
20.0-30.0	114,665	00.658	99.682	11,037,430	07.089	94.912	9721.088	9477.533
30.0-40.0	30,388	00.174	99.856	4,062,543	02.609	97.521	9845.901	9744.298
40.0-50.0	11,151	00.064	99.920	1,681,456	01.080	98.601	9991.900	9860.199
50.0 +	14,196	00.081	100.001	2,177,199	01.398	99.999	—	—
Total	17,436,460			155,687,974			59810.959	52928.807

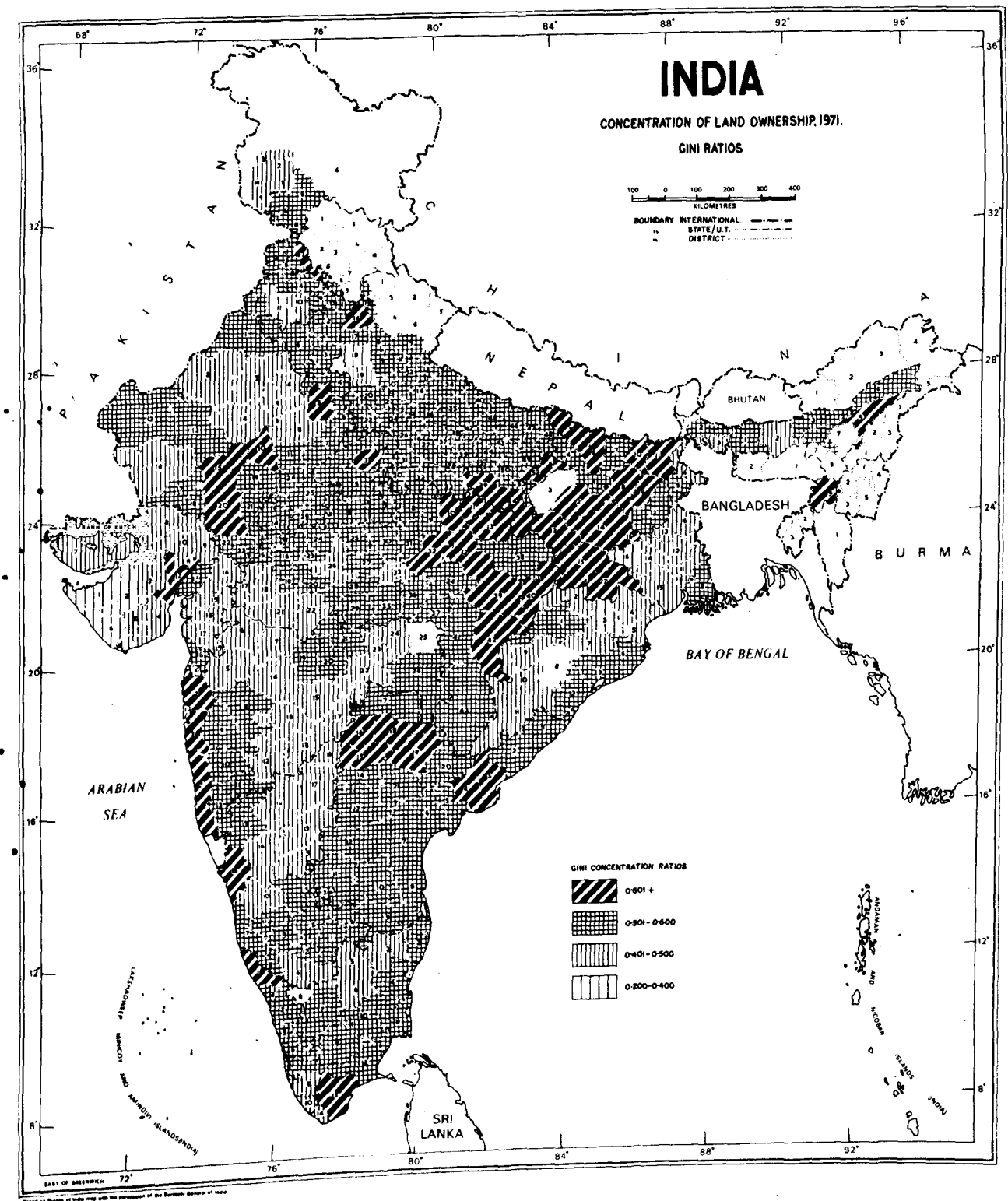
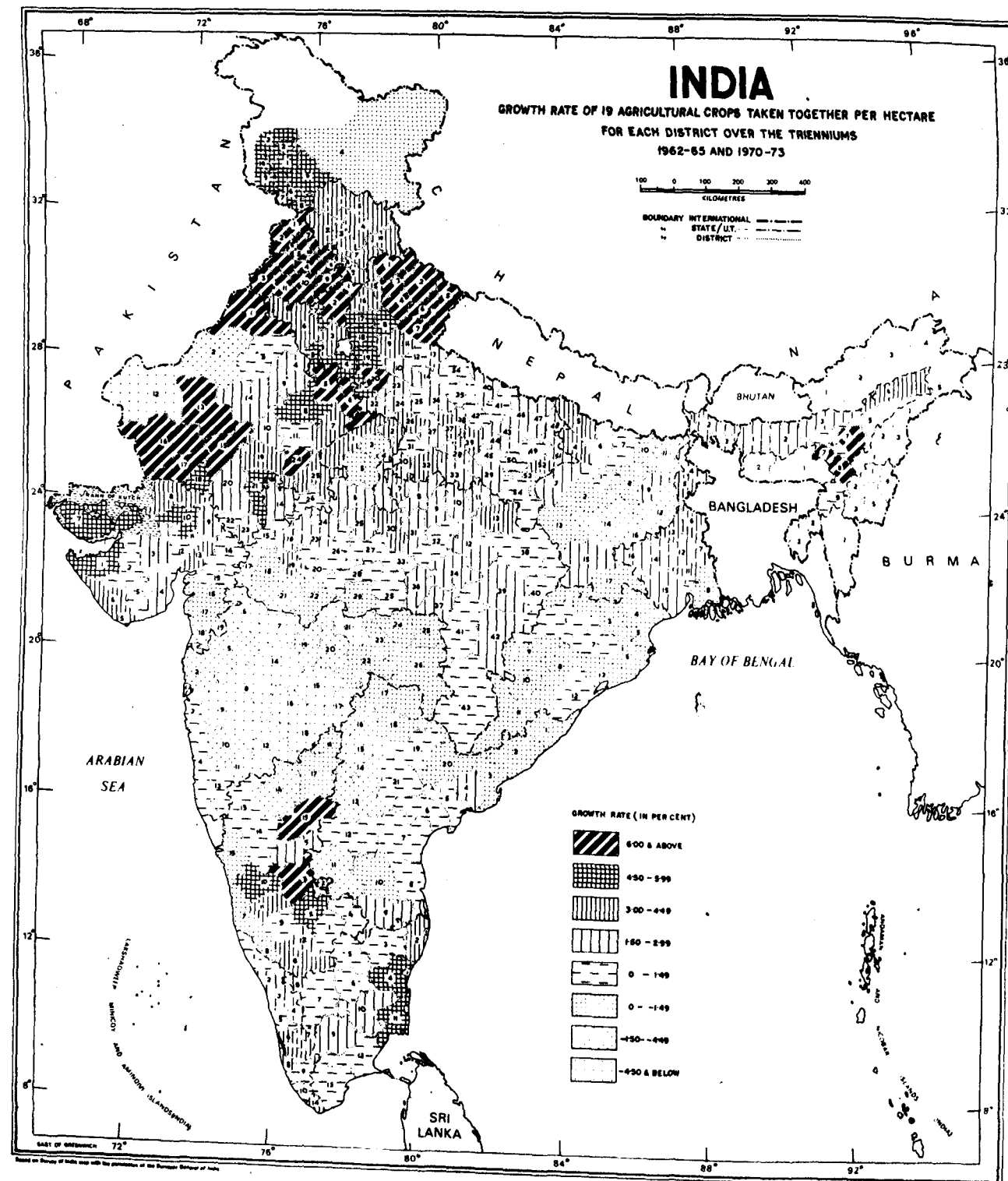
Gini ratio = $6882.152/100 \times 100$
= 0.688

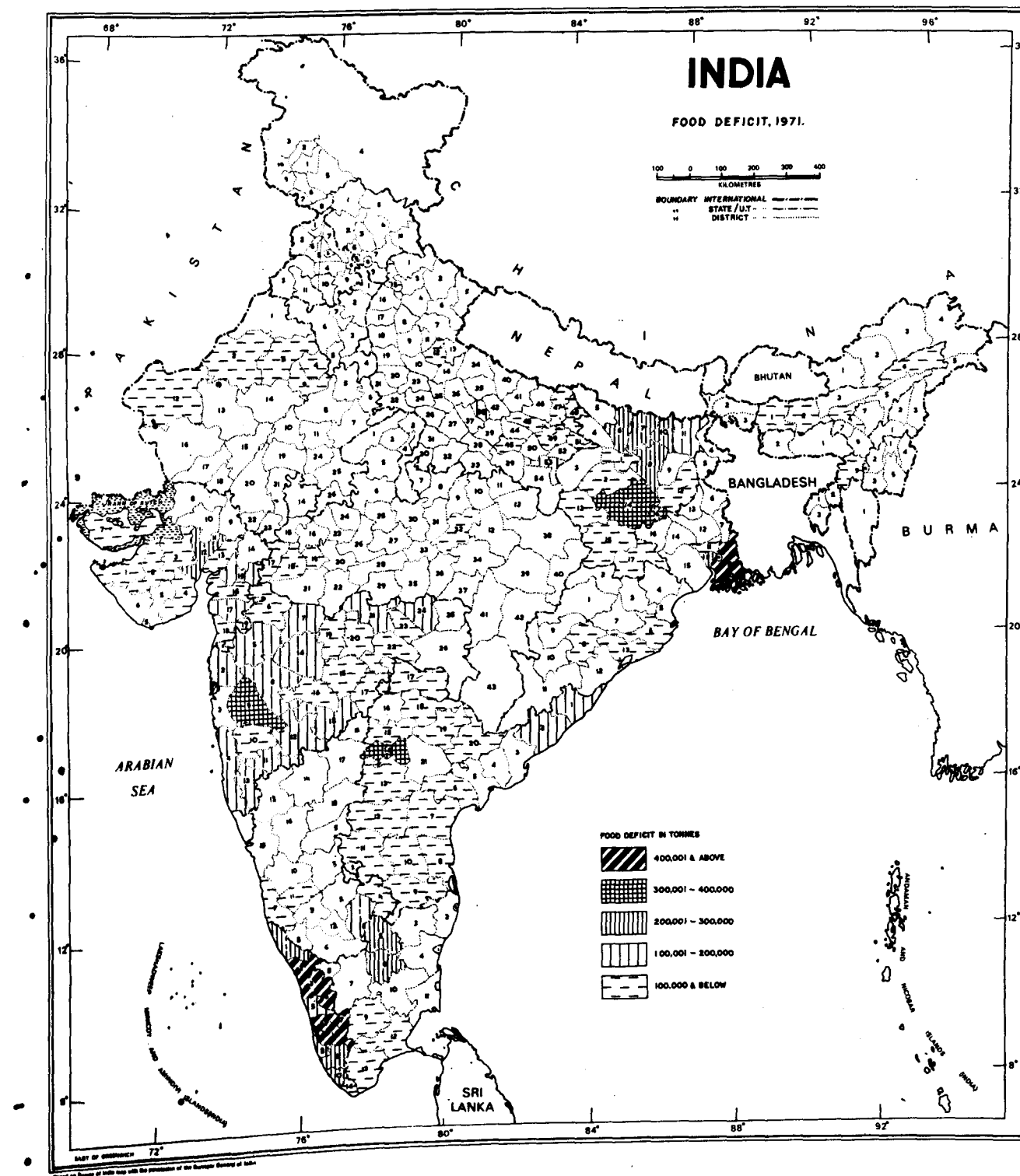
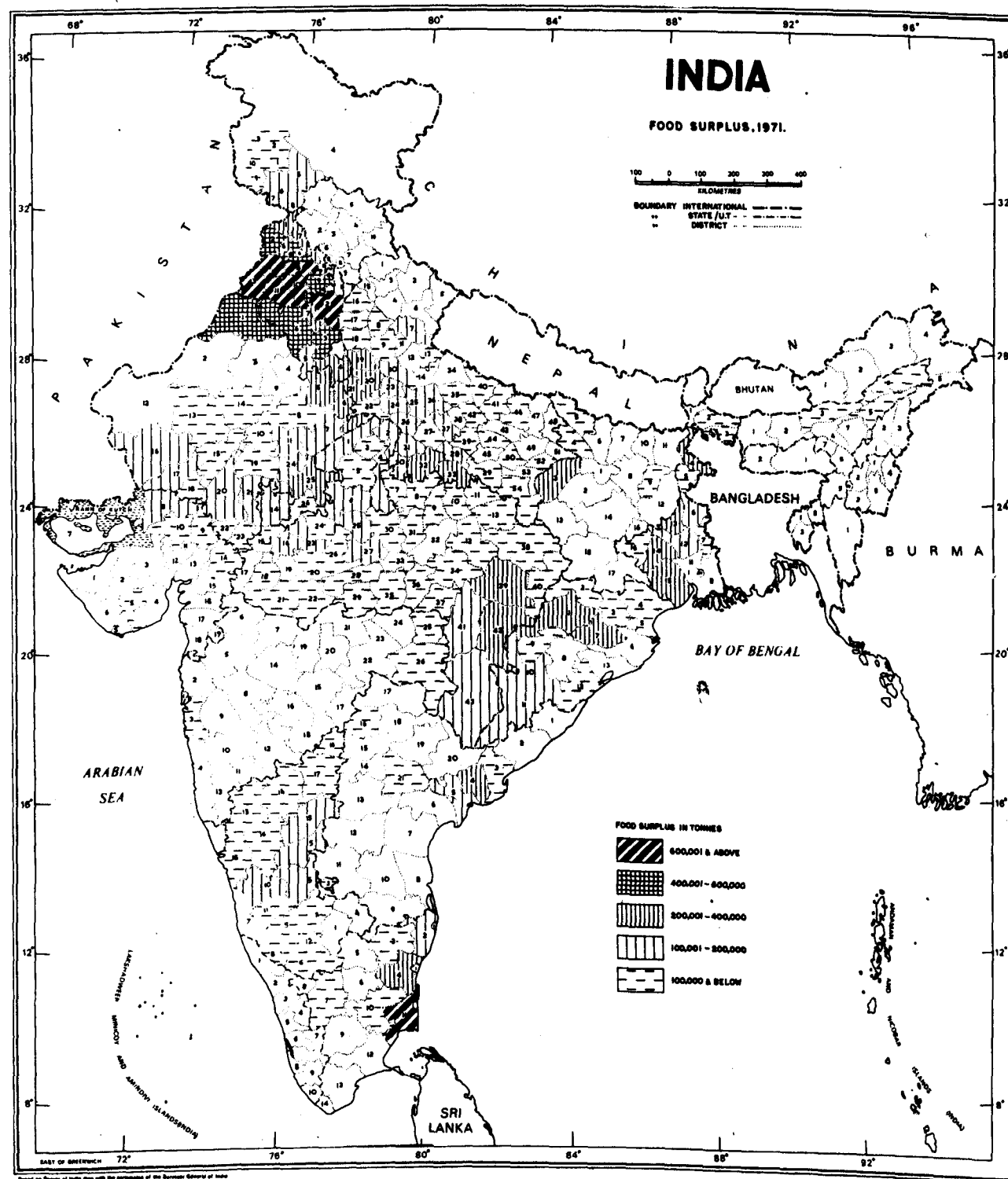
VI. Agricultural Productivity Level Less than Rs. 600 (55 Districts)

Size Class (hectares)	Total of Holding	Per cent of Holding	Cuml. per cent of Holding (X _i)	Total of area owned	Per cent of area owned	Cuml. per cent of area owned (Y _i)	Gini-Ratios X _i Y _{i+1} X _{i+1} Y _i	
1	2	3	4	5	6	7	8	9
< 0.5	640,738	09.156	09.156	300,773	00.557	00.557	18.660	10.132
0.5- 1.0	632,135	09.034	18.190	956,086	01.771	02.038	139.244	70.040
1.0- 2.0	1,132,043	16.177	34.367	2,876,067	05.327	07.655	493.716	361.194
2.0- 3.0	896,909	12.817	47.184	3,623,463	06.711	14.366	1002.802	815.414
3.0- 4.0	670,101	09.576	56.760	3,718,322	06.887	21.253	1596.602	1370.308
4.0- 5.0	539,906	07.716	64.476	3,712,848	06.876	28.129	3524.967	2377.547
5.0-10.0	1,402,789	20.047	84.523	14,330,946	26.542	54.671	6729.383	5234.858
10.0-20.0	785,795	11.229	95.752	13,468,704	24.945	79.616	8456.912	7827.049
20.0-30.0	178,974	02.558	98.310	4,699,974	08.705	88.321	9102.031	8756.586
30.0-40.0	58,415	00.835	99.145	2,302,082	04.264	92.585	9390.519	9210.911
40.0-50.0	23,851	00.341	99.486	1,150,093	02.130	94.715	9948.799	9471.595
50.0 +	36,016	00.515	100.001	2,854,836	05.287	100.002	—	—
Total	6,997,672			53,994,194			50403.635	45505.634

Gini ratio = $4898.001/100 \times 100$
= 0.490







CONCENTRATION CURVES FOR LAND OWNERSHIP—1971

CHART 1

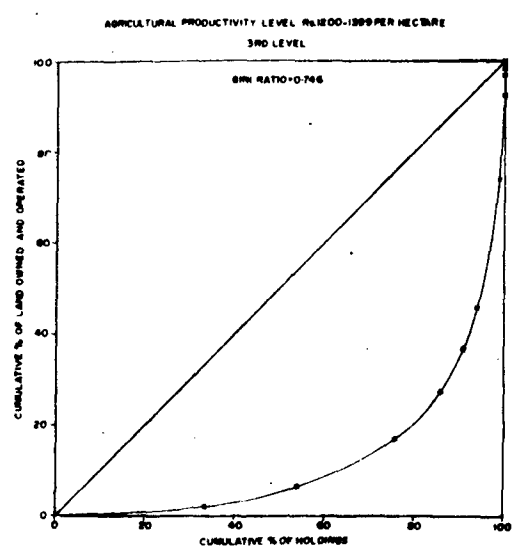
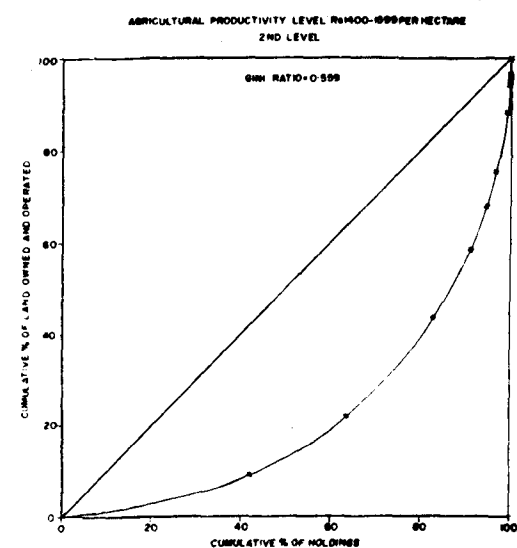
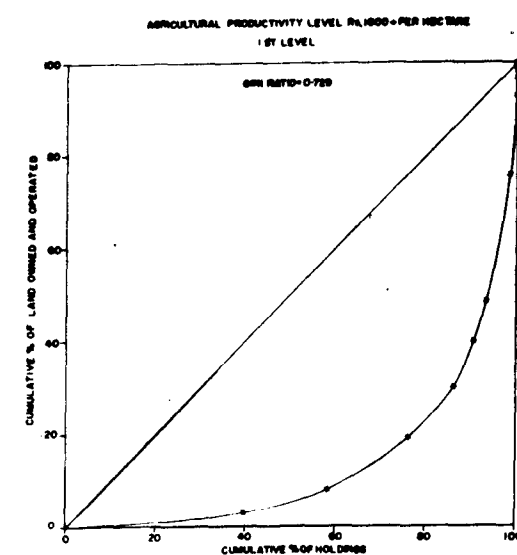


CHART 2

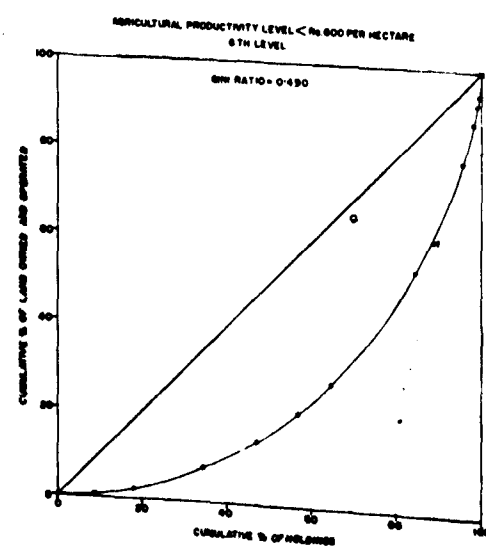
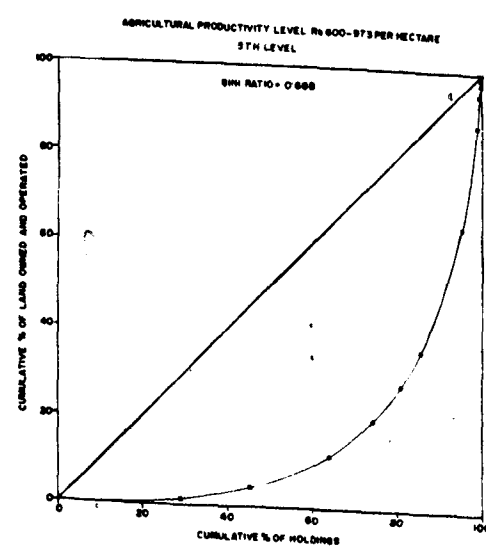
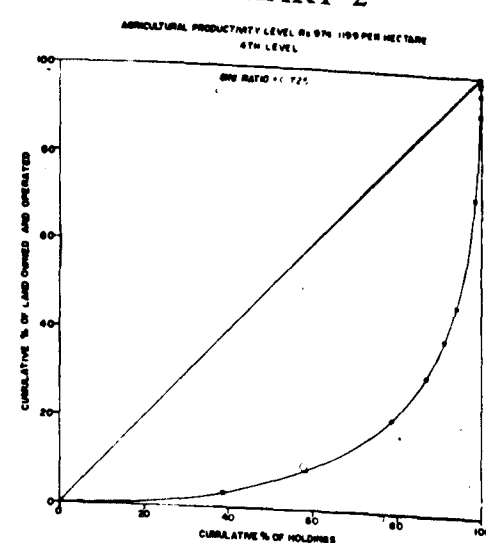


CHART 3

DISTRIBUTION OF AGRICULTURAL PRODUCTIVITY IN RUPEES PER HECTARE IN RELATION TO LAND INEQUALITY.

(53 DISTRICTS HAVING THE HIGHEST GINI RATIOS)

VALUE OF AGRICULTURAL PRODUCTIVITY PER HECTARE (IN RUPEES)

1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400

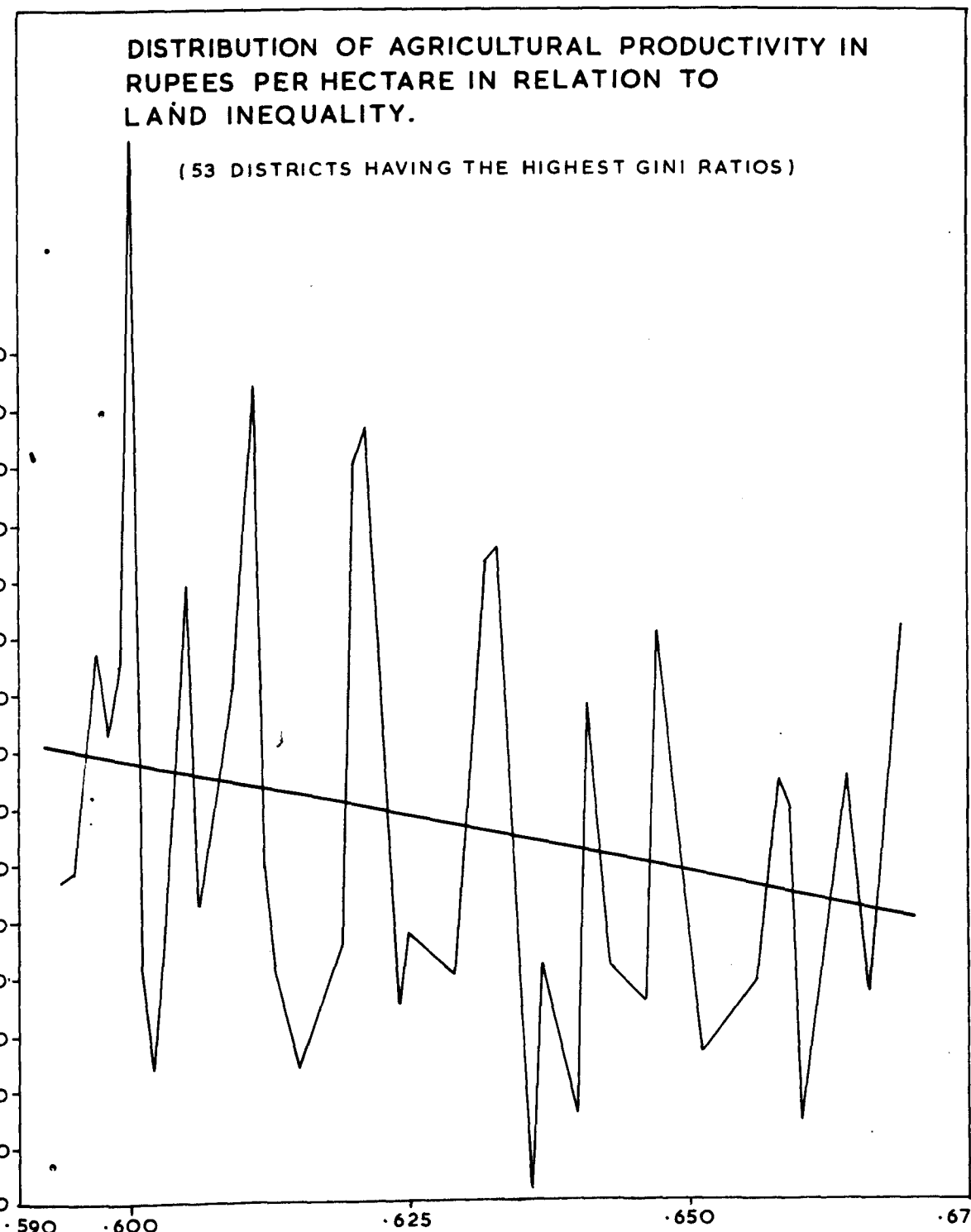
LAND INEQUALITY (GINI CONCENTRATION RATIOS)

.590 .600

.625

.650

.675



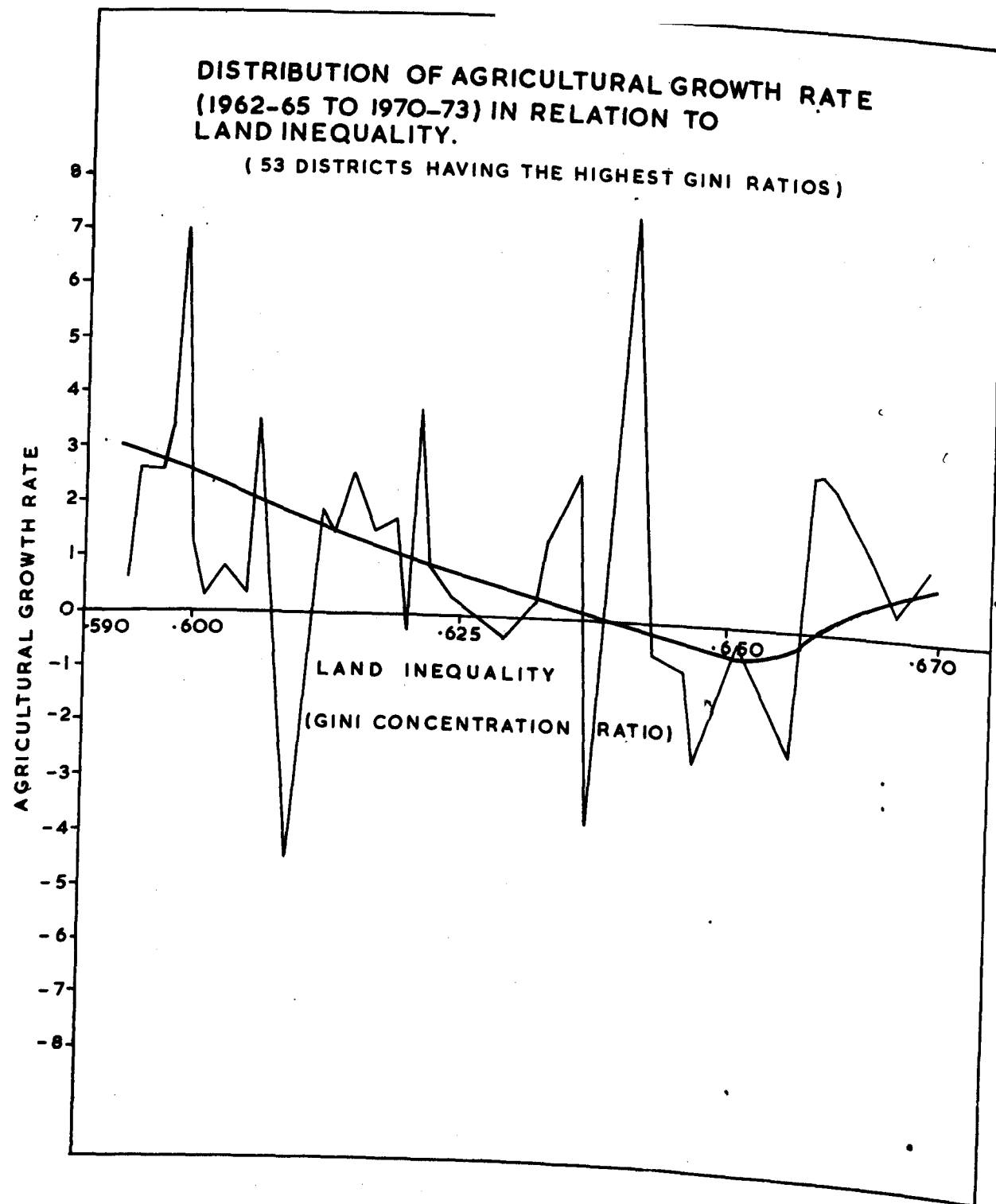


CHART 5

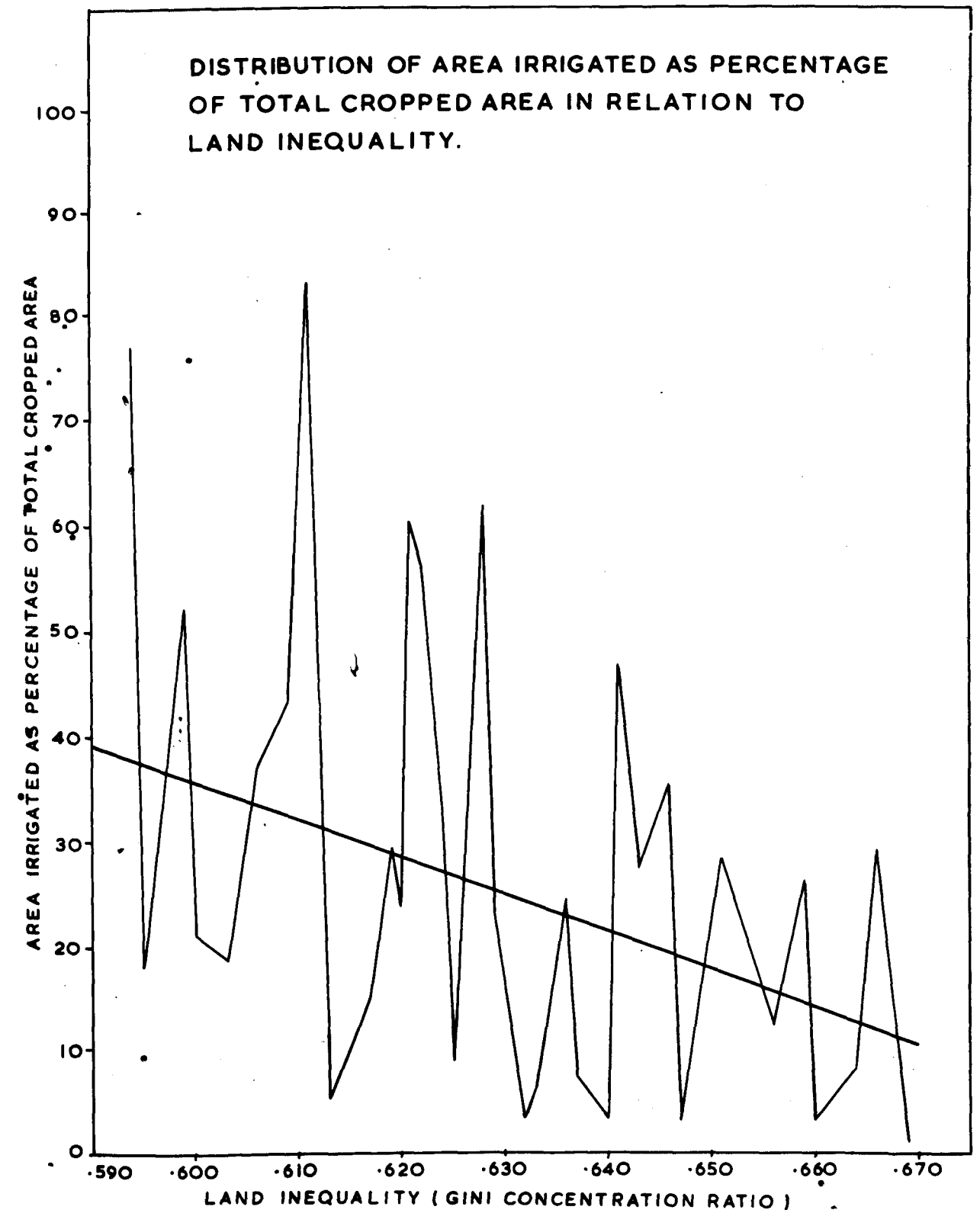


CHART 6

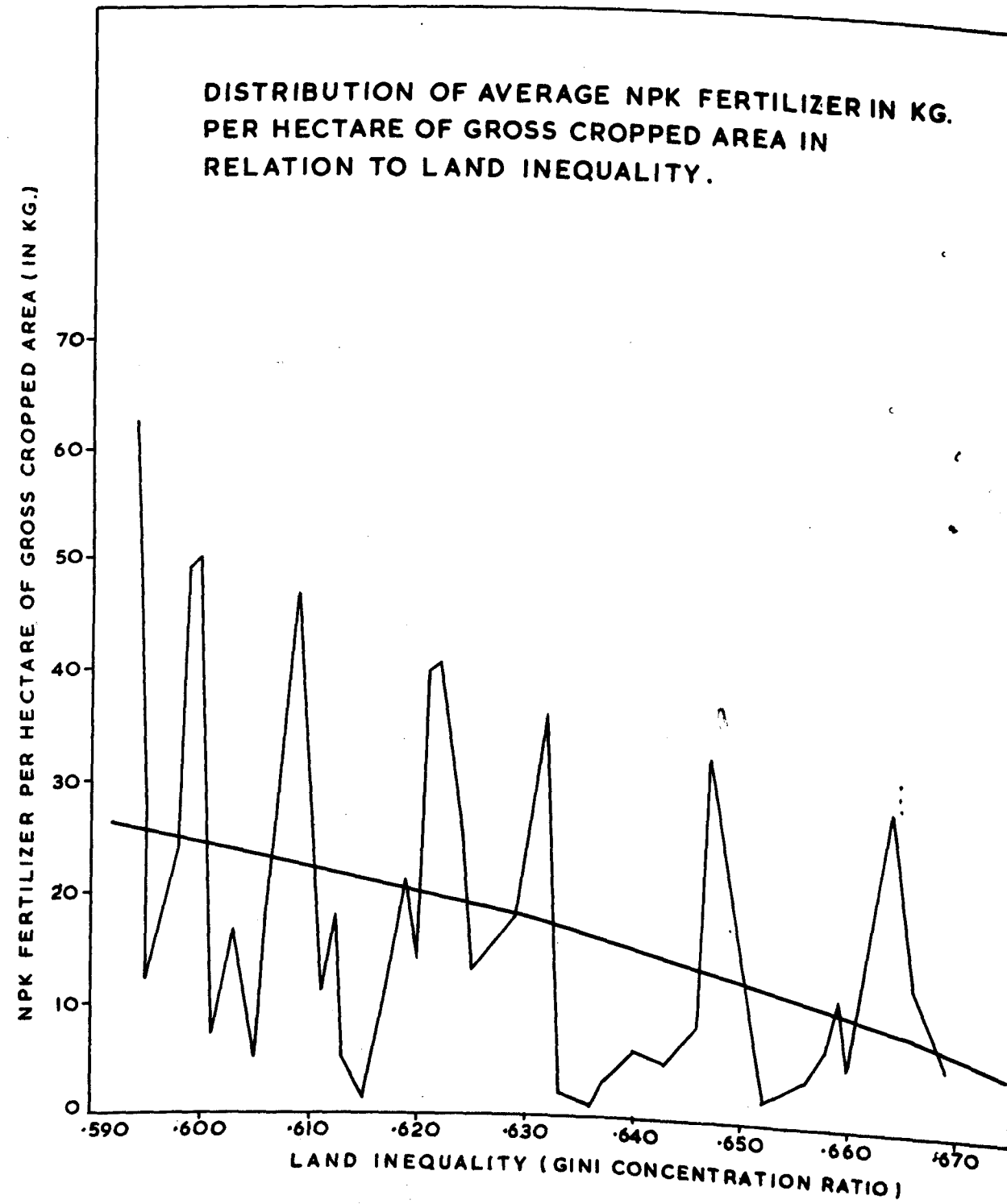


CHART 7

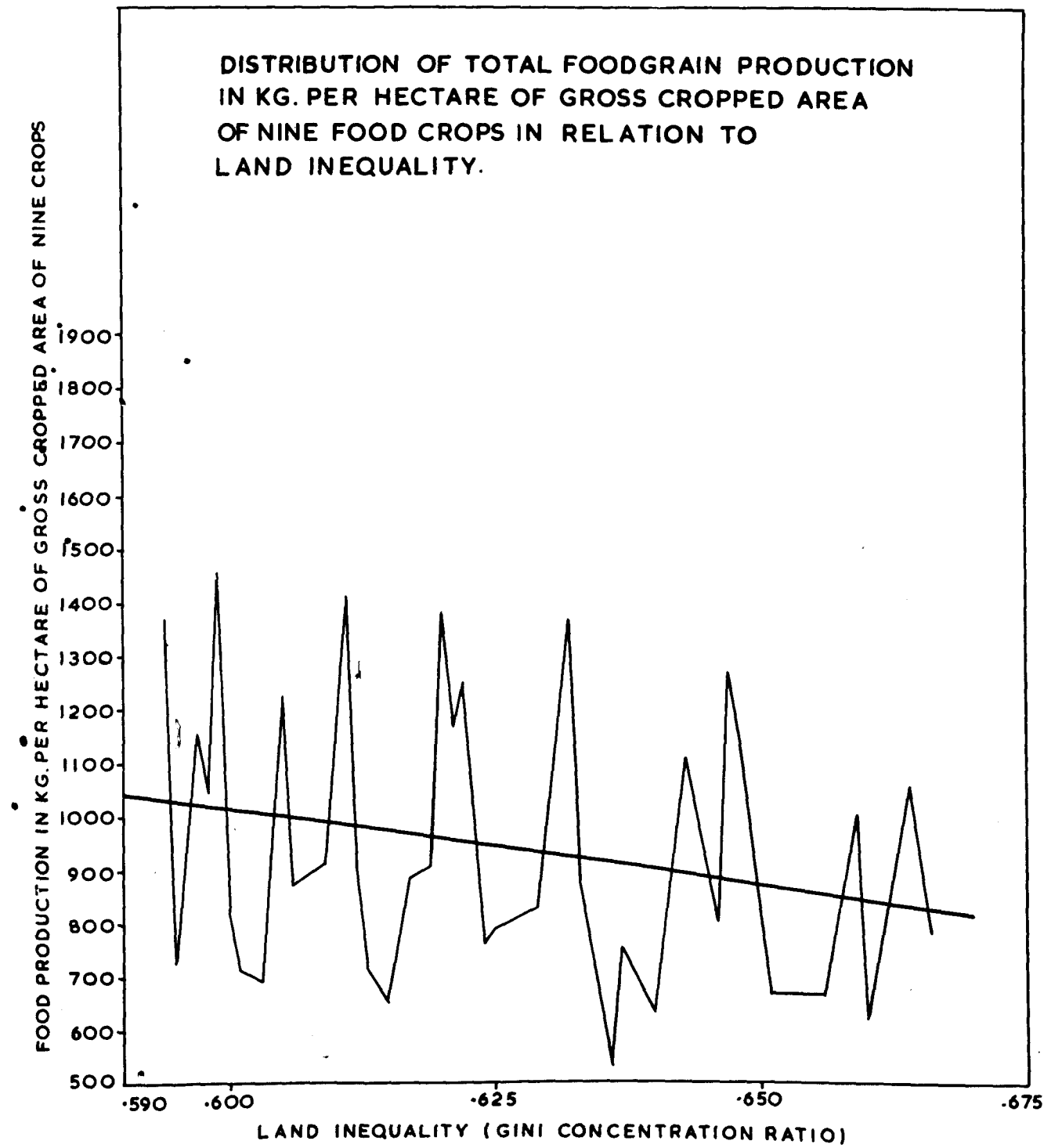
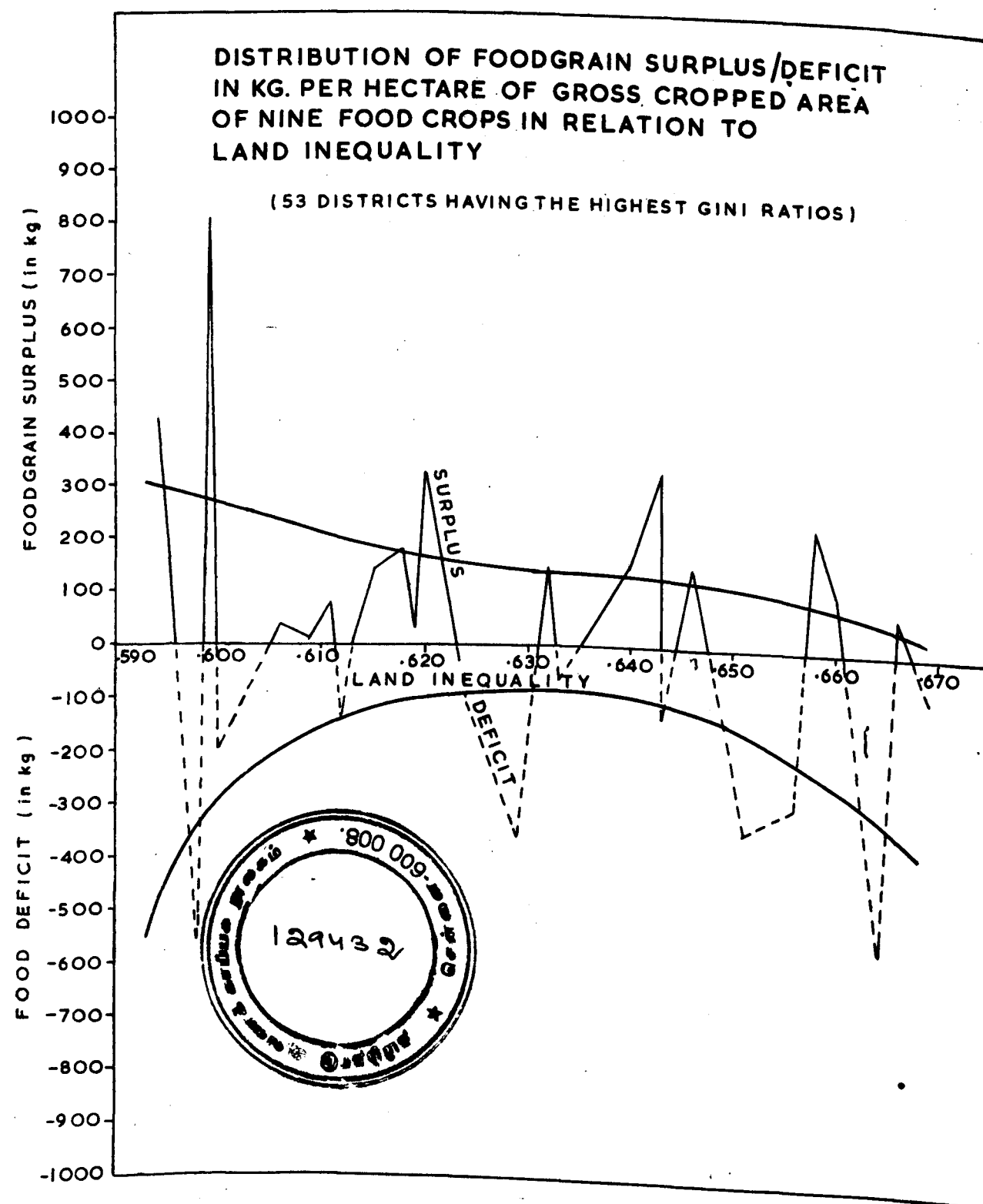


CHART 8



PUBLICATIONS OF THE ICSSR/JNU PROJECT (1975-80)
IMPLICATIONS OF POPULATION CHANGE 1872-1971

Director

ASOK MITRA

*Professor of Population Studies,
 Centre for Regional Development
 Jawaharlal Nehru University*

1. India's Population: Aspects of Quality and Control, Demy 8vo, 2 Volumes, pp. 928, 1978
2. Implications of Declining Sex Ratio in India's Population, Demy 8vo, pp. 85, 1979
3. The Status of Women: Literacy and Employment, Demy 8vo, pp. 74, 1979
4. The Status of Women: Household and Non Household Economic Activity, Demy 8vo, pp. 78, 1979
5. Population, Food and Land Inequality: A Geography of Hunger and Insecurity, Demy 4to, pp. 122, 1980
6. Population of Cities and Towns of India, 1872-1971, Demy 4to, approx. pp. 750 (in the Press)
7. Indian Cities: Their Industrial Structure, Immigration and Capital Investment, 1961-71, Demy 4to, approx. pp. 150 (forthcoming)
8. Functional Classification of India's Urban Areas 1961-71 by Factor Cluster Method, Demy 4to, approx. pp. 175 (forthcoming)
9. The Status of Women: Shifts in Occupational Participation, 1961-71, Demy 4to, approx. pp. 200 (forthcoming)
10. Shifts in the Functions of Cities and Towns of India, 1961-71, Demy 4to, approx. pp. 200 (forthcoming)
11. Female Work Participation in the Three Crop Regions of India: An Intertemporal Study of Rural India, 1951-71, Demy 8vo, pp. 33 plus tables (mimeograph), 1980
12. Uninhabited Villages of Karnataka State 1872-1971, Demy 4to, approx. pp. 100 (being published by Registrar General, India)
13. Inventory of Movement of Cities and Towns between Different Size Classes of Population 1872-1971, Demy 4to, approx. pp. 200 (forthcoming—to be published by Registrar General, India)
14. Analysis of Use of CGHS Facilities in Delhi City, 1972-77, Demy 8vo, approx. pp. 90 (forthcoming)
15. Data Book of Functional Classification of Cities and Towns of India, 1961-71, Demy 4to, approx. pp. 200 (mimeograph)

Note: Item 1 is a Family Planning Foundation of India/ICSSR Study; items 2,3,4 and 9 are publications of ICSSR Committee on Women's Studies conducted at J.N.U; item 11 is an ICSSR Committee on Women's Studies/JNU Study partly based on ICSSR Project research but independently produced; item 5 is an ICSSR/JNU/FPF Study. The rest are ICSSR JNU Studies