POPULATION GROWTH AND AGRICULTURE DEVELOPMENT IN RAJASTHAN : 1971-1981

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RAJESHWARI

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCES
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NEW DELHI-110067, INDIA

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जवाहरलाल नेहरु विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI-110067

CENTRE FOR STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCES

CERTIFICATE

This is to certify that the dissertation entitled, "POPULATION GROWTH AND AGRICULTURE DEVELOPMENT IN RAJASTHAN: 1971-1981", submitted by Rajeshwari, infulfilment of six credits out of total requirements of twenty-four credits for the Degree of Master of Philosophy (M.Phil) of the University, is a bonafide work to the best of my knowledge and may be placed before the examiners for evaluation.

Dated: 20.7.88

(K.P. DHURENDHAR)
SUPERVISOR

(ASHOK MATHUR)
CHAIRPERSON

Gram : JAYENU Tel. : 667676, 667557 Telex : 031-4967 JNU IN

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Rajeshwari

RAJESHWARI

New Delhi.

July 20, 1988.

C O N T E N T S

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LIST OF MAPS AND GRAPHS

LIST OF TABLES

CHAPTER-I

I N T R O D U C T I O N

Indian agriculture is the mainstay of its population. It contributes nearly 40 per cent of the national income and provides employment to about 70 per cent of its population. The primary objective of this study is to understand the nature of relationship between agricultural development and growth of rural population. The concentration (about 74 per cent) of population in Indian villages confirms a deep rooted relationship between land and people. Therefore, the significance of data on agriculture and food can be understood only when they are placed in relation to each other, i.e. agricultural data with the population census, and related demographic characteristics which are the population size, distribution and density, etc.

The study takes up the case of Rajasthan. Rajasthan is the second largest state in India (areawise), and covers 5.18 per cent of country's population. This state has been selected because 79 per cent (1981) of it's population lives in rural areas with predominance of agriculture. About 83 per cent (1981) of total work-force is engaged in agricultural activities. Administratively, it consists of 26 districts and in all the districts, agriculture is

the main occupation of bulk of the population. Moreover, population growth rate is high as compared to other states of India. It is 32.38 per cent during 1971-81, which is higher than the national average of 24.78 per cent. In rural Rajasthan also, growth rate of population is high (2.7 per cent/ annum).

The increasing trend in population growth raises questions regarding land-use, particularly in a state like Rajasthan, where land-use and farming practices are affected by the availability of water. This increase in population is marked by a great emphasis on arable farming. In Rajasthan, agricultural productivity is lower than other states of India. But Vidya Sagar[1] (1977) argued that the low and stagnation in agricultural performances could not be analysed by taking a macro view of situation. A few zones in the state produced a major part of the total agricultural output.

The yield level of eastern districts of Rajasthan is much higher as compared to that of the western districts.

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1. Vidya Sagar, "A component analysis of the growth of agricultural productivity in Rajasthan: 1951-61 to 1969-74," Indian Journal of Agricultural Economics, Vol. XXXII, No.1, Jan-March, 1977, pp.110.

This is largely because of the uncertain and high variability in the moisture-retaining capacity of the soil. Likewise, density of population is higher in the eastern Rajasthan as compared to the districts of the west. Population increase progressively shortens the interval between successive cropping. Multiple and relentless cropping also exhausts the fertility of the soil. This needs serious consideration as the population pressure which took place during 1960's and 1970's is bound to recur during the following decades also.

Does population lead to any positive effect on the development of agriculture or land-use in the state? Has the optimum carrying capacity of the land is in association of population density and population growth? Is multiple cropping and agricultural development, mainly defined as increase in output and use of input, responding to increasing population. Hence, it is essential to determine the extent of population pressure on land and changes therein in order to draw a plan for optimum use of land.

Various economists, from the very beginning, have depicted the interrelation between population growth and agricultural development through various economic theories.

Some of them provide positive effect of population growth on agricultural development, whereas, some others point a gloomy picture. A brief of these theories has been attempted in the following section. This will be extremely helpful as trends in experts' opinion on the problem could be had which would help in the understanding of the empirical situation.

II. Objectives of the study:-

Following are the objectives of the present study:

1. To analyse spatio-temporal variations in density of rural population and growth of rural population.
2. To analyse spatio-temporal variations in agricultural workforce of the state.
3. To analyse spatio-temporal variations in agricultural land-use and land-use efficiency.
4. To analyse spatio-temporal variations in agricultural productivity and carrying capacity of the land.
5. To analyse spatial as well as temporal variations in irrigation and other modern agricultural inputs.
6. To analyse relationship between levels of agricultural development (landuse, landuse efficiency and

productivity, labour productivity, carrying capacity of the land, and use of modern agricultural inputs such as irrigation, fertilizers etc. and density of rural population, landman ratio, rural literacy and proportion of agricultural workers in total rural work-force.

III. Hypotheses:-

Following are the hypotheses which are to be tested:

1. Density of rural population is positively correlated with:

(i) Proportion of net sown area.

(ii) Intensity of cropping.

(iii) Land and labour productivity.

(iv) Optimum carrying capacity of the land.

(v) Proportion of irrigated area.

(vi) Proportion of area under major foodgrains.

(vii) It is inversely correlated with proportion of fallow land.

2. Land-man ratio is positively correlated with:

(i) Proportion of net sown area.

(ii) Intensity of cropping.

(iii) Land and labour productivity.

(iv) Optimum carrying capacity of land.

(v) Proportion of irrigated area.

(vi) Proportion of area under major foodgrains.

(vii) It is inversely correlated with proportion of fallow land.

3. Rural literacy rate is positively correlated with:

(i) Land and labour productivity.

(ii) Agricultural mechanisation (number of tractors, electric and diesel pumpsets per thousand ha. of cultivated land.

4. Growth of rural population is positively correlated with:

(i) Net sown area.

(ii) Gross cropped area.

(iii) Land productivity.

(iv) Labour productivity.

5. Growth of agricultural workers is positively correlated with:

(i) Net sown area.

(ii) Gross cropped area.

(iii) Land productivity.

(iv) Labour productivity.

IV. Source of data:-

The present study is based entirely on secondary sources of data obtained from Census of India, Rajasthan and various publications of centre and Government of Rajasthan on agriculture. For population variables, data has been collected for two periods of time, 1971 and 1981, Following are the sources of data:

(i) General Population Tables, Part II A (i), Census of India, Rajasthan, 1971 and 1981.

(ii) General Economic Tables, Part III, A and B, Vol.II (i), Census of India, Rajasthan, 1971 and 1981.

(iii) General Report, Part I - Census of India, Rajasthan, 1971 and 1981.

Secondary data regarding land utilization, area and production of principal crops, agricultural implements and machinery and area under irrigation has been collected for the years, 1969-70, 1970-71, 1971-72 and 1979-80, 1980-81, 1981-82. Following Government publications have been used for this study:

(i) Indian Agricultural Statistics and Agricultural Situation of India of concerned years, published by Economic and Statistical Organisation, Ministry of Agriculture, New Delhi, India.

(ii) Statistical Abstract of Rajasthan of concerned years.

(iii) Season and Crop Reports and Agricultural Census of Rajasthan of concerned years, published by Directorate of Economics and Statistics, Govt. of Rajasthan. Data regarding agricultural implements and machinery pertains to two periods 1972 and 1977.

(iv) Data regarding consumption of fertilizers in Rajasthan was available only for later period of study, i.e. 1979-80, 1980-81 and 1981-82. Its source is Fertilizers Statistics, Fertilizers Association of India, New Delhi (1979-80, 1980-81 and 1981-82).

(v) Data regarding farm harvest prices of principal crops (1979 to 1982) has been collected from Farm Harvest Prices of Principal Crops in India published by Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi, 1983.

V. Study Organisation and Research Methodology:-

This study has been organised into five chapters. The first chapter discusses nature of the problem, theoretical concepts and framework, review of literature pertaining to present study, research methodology, data base and research hypotheses. The second chapter presents a picture of

population profile of Rajasthan. This chapter analyses spatio-temporal variations in population distribution, growth and other socio-economic characteristics of rural population in the state. Percentages of various population aspects such as percentage of rural workers to total work-force, percentage of rural workers to total rural population, percentage of agricultural workers, percent literates, etc. have been computed for both the time period - 1971 and 1981. Dependency ratio has been calculated by using formula:

$$\text{Dependency ratio} = \frac{P_{0-14} + P_{60+}}{P_{15-59}} \times 100$$

Whereas P denotes population of given age-groups. Simple growth rate and change has been computed to show temporal variations in socio-economic characteristics of population such as: rural population, rural work-force, rural agricultural workers, density of rural population, rural dependency ratio and rural literacy rates.

Population concentration has been shown with the help of lorenz curve. Choropleth technique has been utilized to show spatial variations in socio-economic characteristics of rural population.

The third chapter examines and analyses the spatio-temporal variations in levels of various indicators and agricultural inputs in the state. All the indicators in absolute or relative figures have been computed from triennium averages of agricultural data pertaining to the periods 1969-70, 1970-71, 1971-72 and 1979-80, 1980-81 and 1981-82. Henceforth, reference to 1970-71 and 1980-81 periods pertains to triennium averages of the respective periods - 1969-70, 1970-71, 1971-72 and 1979-80, 1980-81 and 1981-82. Percentages of various land use categories in total geographical area of Rajasthan has been computed to determine proportion of each category. Intensity of cropping has been computed with the help of formula:

$$\text{Cropping Intensity:} = \frac{\text{Gross Cropped Area}}{\text{Net Cropped Area}} \times 100$$

Similarly, proportion of net irrigated and gross irrigated area in net sown area and gross cropped area has been computed. Intensity of irrigation has been computed as per formula:

$$\text{Irrigation Intensity} = \frac{\text{Gross Irrigated Area}}{\text{Net Irrigated Area}} \times 100$$

Consumption of chemical fertilizers has been computed as Kilograms per thousand hactares of gross cropped area.

Numbers of electric/diesel pumpsets per thousand hactares of net sown area also has been computed.

Area and production of 15 major crops of the state namely bajra, jowar, wheat, barley, maize, rice, gram, tur, seasmum, rape and mustard, lineseed, castorseeds, groundnut, sugarcane and cotton have been taken into account to determine agricultural land and labour productivity. These 15 crops cover 74.29 per cent and 69.28 per cent of gross cropped area of the state in 1969-72 and 1979-82 respectively.

Quantum of production of these 15 crops has been converted into money terms by multiplying with the farm harvest prices of 1981-82 and summing the total. Total output in money terms of these crops has been inflated to 100 per cent gross cropped area. Land and labour productivity have been computed as:

$$\text{Land Productivity} = \frac{\text{Inflated Output in money terms}}{\text{Cultivated Area}}$$

$$\text{Labour Productivity} = \frac{\text{Inflated Output in Rupees}}{\text{Number of Agricultural Workers}}$$

Agricultural workers = Agricultural labourers + Cultivators.

Man-land ratio has been cultivated with the help of the following formula:

$$\text{Man-land ratio} = \frac{\text{Arable land}}{\text{Rural Population}}$$

where arable land = Net sown area + Current fallow + culturable waste land +other than current fallow + area under tree crops

Land man ratio has also been computed in order to determine population pressure on land resources as:

$$\text{Land-man ratio} = \frac{\text{Rural Population}}{\text{Arable land}}$$

Optimum carrying capacity of land has been computed with the help of formula devised by Jasbir Singh as:

$$\text{Optimum carrying capacity (of the land)} = \frac{\text{Calories available for ingestion per sq. miles}}{\text{Weighted st. nutrition unit for ingestion in calories/person/annum}}$$

$$\text{whereas calories available for ingestion per sq. km.} = \frac{\text{Total calories available for ingestion}}{\text{Percent of total cropped area}}$$

And standard nutrition has been taken as 2000 calories per person per day and then converted for the year.*

Crop-combination analysis has been done with the help of Doi's formula which is an improvement of Weaver's method. Weaver's formula of crop-combination is based on

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*For details see, Jasbir Singh and S.S. Dhillion, "Agricultural Geography", 1984, pp. 400-01 (Appendix).

the technique of least deviation of actual percentages from the standard theoretical combination. The least deviation between theoritical base curve and actual value is considered to be crop-combination.

Doi has modified Weaver's formula because sometimes it includes minor crops in the combination in case of continuity in the proportion of area under secondary and minor crops. Doi has applied least square technique. According to him, the crops which have minimum sum of square deviation (Σd^2) between actual percentage and theoretical base form the crop-combination. This method does not require calculation and has been established by consulting one-sheet table prepared by Doi.

Moreover, simple growth rate and change has been computed to show temporal variations of various indicators of agricultural and technological growth. Spatial variations in levels of various agricultural growth indicators has been shown with the help of Choropleth maps.

Relationship between population growth and other socio-economic characteristics of population and various variables of agricultural growth has been discussed in fourth chapter. This has been done with the help of

correlation matrices. There are two sets of variables. First set of variable shows values of correlation coefficient for two periods of time, 1970-71 and 1980-81. Variables of first set are:

X_1. Rural population density.

X_2. Rural literacy.

X_3. Proportion of agricultural workers in total rural work-force.

X_4. Proportion of fallow land in total geographical area.

X_5. Proportion of net sown area in total geographical area.

X_6. Proportion of gross irrigated area in gross cropped area.

X_7. Tractors per thousand hectares of net sown area.

X_8. Oil engines/electric pumps per 1000 ha. of net sown area.

X_9. Proportion of area under major foodgrains to G.C.A.

X_{10}. Optimum carrying capacity of the land.

X_{11}. Agricultural land productivity.

X_{12}. Agricultural labour productivity.

X_{13}. Land-man ratio.

X_{14}: Cropping intensity.

Second set of variables shows correlation between growth of population and agriculture indicators over a decade. These are:

X_1 = Growth of rural population.

X_2 = Growth of agricultural workers.

X_3= Growth of net sown area.

X_4= Growth of gross cropped area.

X_5= Growth of agricultural land productivity.

X_6= Change in cropping intensity.

X_7= Growth of agricultural labour productivity.

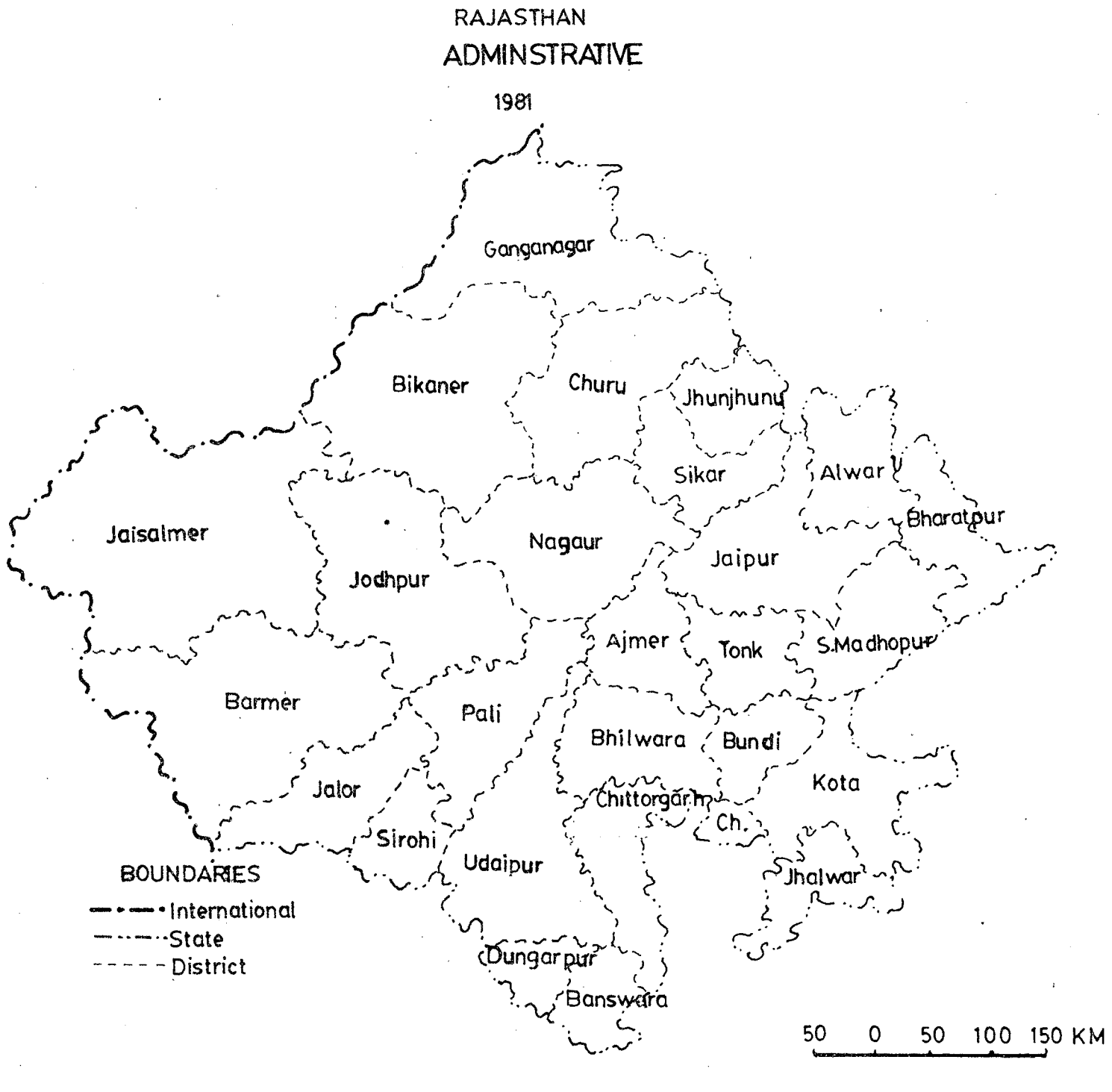
Fifth, and final chapter is summary of conclusions drawn from the present study.

VI. Study Area:-

Study area is comprised of Rajasthan state, situated in the north western part of the country between $23^{o}3'$N to $30^{o}12'$N latitudes and $69^{o}30'$E to $78^{o}17'$E of longitudes. Western boundary of the state has international border with Pakistan. The state is flanked by Punjab in the north, Haryana and Uttar Pradesh in east and Madhya Pradesh and Gujarat in south. It covers an area of about 342, 274 sq. kms. which is second largest state of India.

Physiographically, state cut across Indo-Ganga plain with the Thar desert in the west and Aravallis in the east. Aravallis in the east and south-east Rajasthan, is one of the oldest mountain system of the world. East of Aravallis, there is vast fertile alluvial plain. While west of Aravallis, land is desert, dotted with huge shifting

fig. 1.1


RAJASTHAN
ADMINSTRATIVE
1981
Ganganagar
Bikaner
Churu
Jhunjhunu
Sikar
Alwar
Bharatpur
Jaisalmer
Nagaur
Jaipur
Jodhpur
Ajmer
Tonk
S.Madhopur
Barmer
Pali
Bhilwara
Bundi
Kota
Jalor
Chittorgarh
Ch.
Sirohi
Udaipur
Jhalwar
Dungarpur
Banswara
BOUNDARIES
International
State
District
50 0 50 100 150 KM

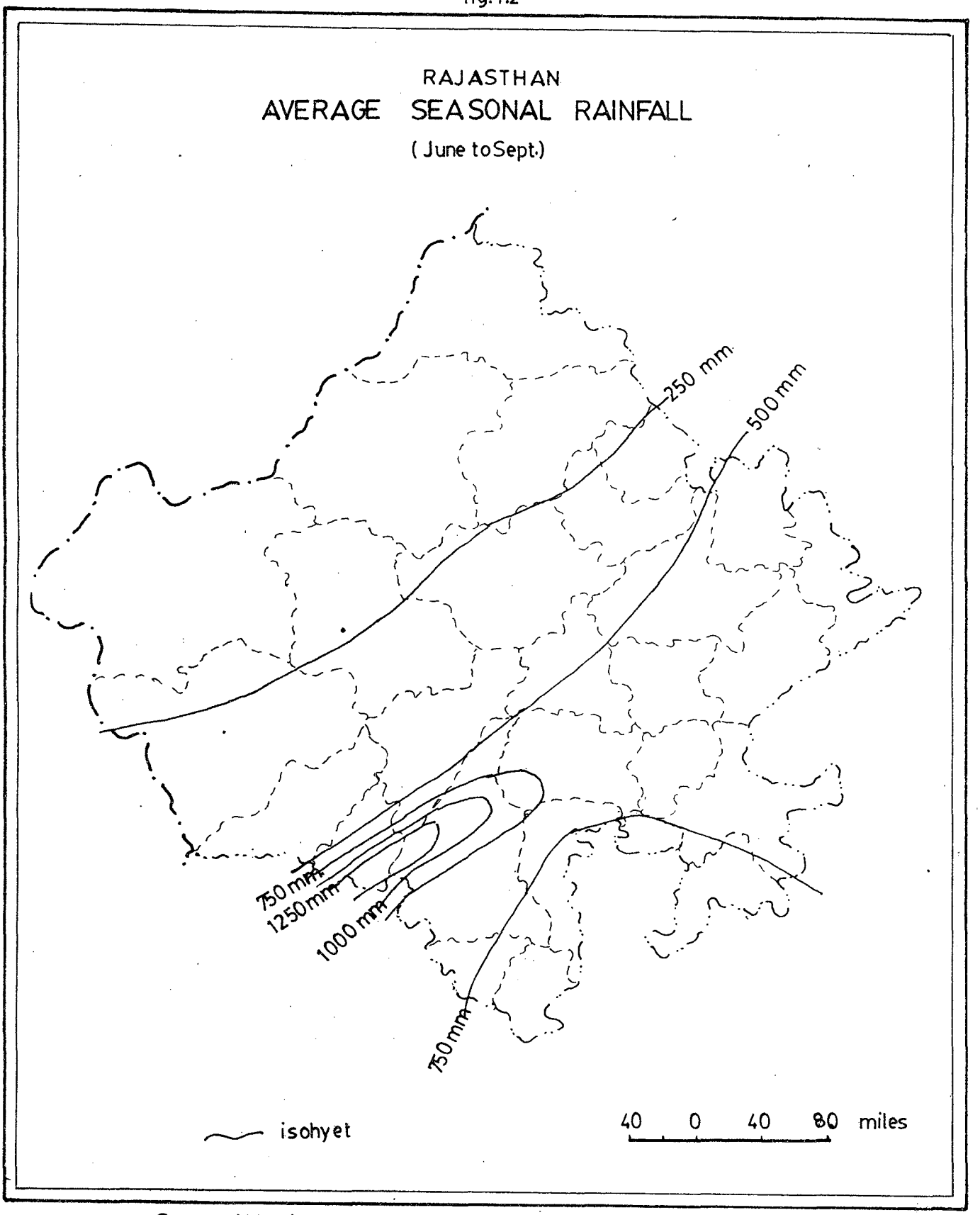
sand dunes. Land is relatively plain in deflation basins. In south eastern part of the state land rises to highlands of central India.

Rajasthan doesn't have prennial rivers. Most of the rivers of the state are seasonal, i.e. originating in rainy season. About 60 per cent area of the state has an inland drainage system. Luni, Sukri, Banas, Sabarmati and Mahi systems originate in south and south-western parts of the state and flow towards Arabian sea. Ghaggar is another seasonal stream which originates from Shiwalik and passes through Haryana and dries up in the sand of Ganganagar district.

Soils are one of the most important natural resources for agricultural operations. Western Rajasthan is characterized by vast stretches of sand deposits. The soil gradually improve towards the east and north-east. It varies from desert soil in the west to medium black soil in the east and alluvial soils in the north and north-east. The soils are rich in calcium and carbon but lack in humus contents.

Extreme climate is the characteristic of Rajasthan. Temperature rises up to 48°C in June and falls as low as 0°C in January. Mean annual temperature in the state rises

fig.1.2



Source : V.C. Misra, GEOGRAPHY OF RAJASTHAN

as moving towards west.[2] During summer, the state experiences intense and scorching heat accompanied with hot winds of high velocity, 'Loo'. Isohyets of 50 cms. passes through the middle of the state. Western most part of the state, Jaisalmer district has annual rainfall less than 25 cms. Average annual rainfall is comparatively higher (above 100 cms), in the eastern most parts of the state. Drought is a common climatic phenomena in most parts of Rajasthan, but it plays havoc to the agriculture of western Rajasthan where frequency of its occurrence is twice in five years period.

VII. Overview of literature:-

At first, Robert Malthus theorised that population grows geometrically while the food supply increases arithmatically, subjecting population to poverty.[3] Malthusian theory of population is a theory of limits. He argues that operational mechanism of the population principle reveals

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2. V.C. Mishra, "Geography of Rajasthan", National Book Trust, New Delhi, 1967, pp.65.

3. D.V. Glass (ed.), Introduction to Malthus, John Willey, New York, 1953, pp. 58-59.

that the size of population in a country tends to gravitate to the levels permitting subsistence standard of living. But the industrial revolution in England and the spread of industrialisation to the European and Americal countries disproved the Malthusian theory of population, which was much concerned with agricultural communities with static social organisation.

Moreover, Malthusian theory of population invited severe criticism from Marx, and Engel and their followers. "Marx pointed out that the Essay in its first form is nothing more than a school-boyish, superficial plagiary of Defoe, Sir James Stuart, Townsend, Franklin, Wallace etc. and doesn't contain a single sentence throughout by himself"[4].

Criticising the postulation of Malthus theory that over population leads to subsistence level of living and poverty. Marx noted that changes in wage level "are, therefore, not determined by variations of the absolute number of working population, but by the varying proportion in which the working class is divided into active and reserve army, by increase or

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4. Quoted from I.D. Valentey (ed.), An Outline Theory of Population, Progress Publishers, Moscow, 1977, pp. 72.

diminution in the relative amount of the surplus population, by the extent to which it is now absorbed, now set free".[5] Malthus was also criticised for methodological and factual unsoundness and abandonment of historical approach. Valentey, one of the follower of Marx noted that, "Malthus abandoned a historical approach to question of population, rejecting the role of social structure in population reproduction and condition of population".[6]

Again, on the Malthusian foundations, Ricardo constructed his theory of economic development. According to him, in the progress of society with increasing population, cultivation of inferior land becomes inevitable.[7] Resources are limited and according to him, supply increases at increasing cost and price. Thus, the Ricardian model of economic development and distribution is a theory of emerging stationary state.

John Staurt Mill further developed the Ricardian dynamics, extended the law of diminishing returns to the

5. Karl Marx, Capital, Vol.1, p. 596.

6. I.D. Valentey, op.cit., p. 76.

7. David Ricardo, "Economic Essays", Ed. by E.C.K. Gonner, Frank Cass, London, 1966, pp. 227-229.

manufacturing sector and affirmed distribution theorem and tendency of profit to fall in industrial development.[8]

By 1900, the three important empirical relationships between fertility levels and socio-economic factors - the inverse relationship between standard of living and fertility levels; social class and fertility levels; and, urban residence and fertility levels, were more or less established.[9]

Thus, the contribution of both the classical and neo-classical schools of political economists to population theory concerned an examination of the controversial issue of the inter-relationship between population and production. The opposing streams of thought were propogated in the present century. According to the classical school, increasing population was as asset of production, resulting in improved standard of living. Neo-classical school maintained, that population increase led to a lowering of production. The controversy arose mainly because the increase in population was considered by the former in

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8. John Stuart Mill (Ashley, Ed.), "Principles of Political Economy", Longmans and Green, London, 1909, pp. 746.

9. Dennis Hodgson, "Demography as a social science and policy science", Population and Development Review, Vol. 9, No.1, March 1983, pp. 1-35.

terms of number of hands that produce, leading to economic well-being, whereas the latter viewed population growth exclusively in terms of the number of mouths to be fed. The point, therefore, is whether population growth, while adding to the number of producers and consumers, simultaneously leads to a proportionate increase in supply and demand.

Though the classical economists accepted the principle of diminishing returns as one of the basic economic laws and gave it the status of natural law, the controversy over the relationship between population and production continued to raise at two levels - the empirical and the theoretical. Over time, it became increasingly clear that the general well-being of the people and population growth went hand in hand. The observation, of course, used to discredit both the Malthusian theory and the principle of diminishing returns.

A neo-classical economist, Marshall pointed out that this law was applicable mainly to agricultural and not to industrial production.[10] This new development again

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10. Alferd Marshall, Principles of Economics, Macmillan, London, 1983, p. 1.

raised questions regarding the relationship between population and production. As a result of these developments, the old debate on whether the socio-economic consequences of a large and growing population were beneficial or harmful appeared to be resolved by the emergence of the theory of optimum population. One noteworthy aspect of the concept of optimum population was that it was a reconcilation of the optimistic and passimistic theories of population; because it implied that the growth of population was beneficial upto a certain point, after which any further growth was harmful.

This theory again has been criticized on several grounds. Several writers have challenged its practical applicability by expressing doubts whether optimum population in the sense of optimum point can ever be determined. Some critics have said that the theory is based on the assumption which are, of course, highly unrealistic. A neo-Malthusian model has been advanced by William and Paul Paddock on the basis of the increasing dependence of less developed countries on the import of foodgrains from the more developed countries. After the second world war, less developed countries became the net importer of foodgrains. They imported 4 million tonnes during 1951-52,

and the inflow increased to 13 million tonnes during 1957 to 1959, 20 million tonnes in 1961 and 25 million tonnes in 1962 .[11] Accordingly, the LDCs, are loosing their capacity to feed themselves as their population was rapidly increasing. William and Paul Paddock gave a gloomy picture that the world doomed to visible starvation.[12]

The gloomy prognostications of a great food crisis and catastrophe in India during 1975 proved patently false, India in 1985 can feed itself with its self-sufficient position in foodgrains achieved through the Green Revolution.[13] Moreover, the Green Revolution enabled Phillipines to achieve self-sufficiency in rice production; Japan, a long-term importer of rice produced huge surplus. Wheat farm productivity in Ceylon increased by 30 per cent. Thus, the Green Revolution following population explosion, arrested food crisis in several developing countries and censured the Neo-Malthusians.

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11. American Science Advisory Commission, World Population and Food Supplies, p. 7.

12. William Paddock and Paul Paddock, Famine: 1975. Indian Journal of Agricultural Economic, Vol. 23, No.3, 1968, p.7.

13. D.L. Narayana,"Population Growth and Economic Growth", Indian Economic Journal, Oct.-Dec., 1984, Vol. 32, No.2, pp. 20-29.

The fact that population growth is a determinant of agricultural change is most persuasively argued by Esther Boserup. Citing the evidence of many agricultural communities in historical perspectives; she has confirmed that technological changes have been taking place because of population growth not vice-versa.[14] According to her, under the pressure of increasing population, there has been a shift in recent decades from more extensive to more intensive system of land use in virtually every part of underdeveloped regions and this system of land-use determines the kind of agricultural tools needed in a given context. She also deals with the technical progression and regression depending on the density of population as she says "the growth of population is a major determinant of technological change in agricultural development". Boserup believed that all parts of the world have experienced these changes owing to population density and that present spatial variations in intensity are a function of density. She also believes that spatial variations in population density explains current geographical differences in farming practices.

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14. Esther Boserup, "The Conditions of Agricultural Growth: the economics of agrarian change under population pressure", George Allen and Unwil; London, 1965.

Kuznets (1966) has defined modern economic growth as a sustained increase in population attained without any lowering of per capita product, and some of the theorizing about the relationship between population and economic growth has sought a positive effect of the former on the latter. He gave reasons for this: (i) because of its stimulating effect on demand and its risk-reducing incentive to investment; (ii) it provides constant improvement of the labour-force with better-trained workers;&(iii) population pressure may encourage technological innovations, particularly in agriculture.[15] Moreover, large population size permits economics of scale in production for large markets.

U.N. ESCAP (1975) have explored the effect of population pressure in delaying the achievement of development goals in agriculture. In this study, intra as well as inter-country analysis has been done for the three countries, namely Japan, India and Sri Lanka.[16] In case of India, two regions covered in this study were Punjab and Orissa. It

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15. Simon Kuznets, Modern Economic Growth:Rate, Structure and Spread; Current Thought Series, 8, 1966, pp.34-40.

16. "Comparative study of population growth and agricultural change", United Nations, Economic and Social Commission for Asia and the Pacific, Bankok, 1975, pp. 20-25.

concludes that population does not under all circumstances affect agricultural development adversely; if agricultural growth is sufficiently buoyant, sustained population can be a help rather than a hinderance to it.

Another study, on the village of Punjab to investigate the effects of agricultural development on demographic features reveal that 17 per cent increase in population led to all negative effects which are reduction in land per head, reduction in the size of farm, reduction in income per head.[17]

In 1977, Bremer, in his study came out with the fact that population pressure forces farmers to reduce the fallow period. But this decreases the yield of land as happened today in parts of south Ghaha. Bremer depicts, where two or three decades ago, farmers cultivated portion of their land at 7 to 10 years interval and now return to each holding after only 4 or 5 years, i.e. before the land has regained its full rate of fertility. Again, although total output is usually greater than it was a decade ago or two, per acre yield and per capita production are smaller.[18]

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17. H.S. Sundra and P.C. Deb, Agri-Economic Development and Demographic Change - A longitudinal profile, Punjab Agricultural University, Ludhiana, 1977.

18. Y.S. Bremer, Agriculture and Economic Development of low Income Countries, Paris, 1971, pp. 25.

Research relating population and development demonstrates that extremely rapid population growth rates can exacerbate development problems. According to Nancy Birdsall, early efforts to include population in growth models include the well known 'trap' and low-level equilibrium concepts; although the assumption of these and later more elaborated models are often questioned, even sceptics seldom question their basic premise that population growth has implications for capital accumulation, employment levels, income and its distribution, public expenditure on social sciences and food availability.[19]

Inspite of the overwhelmingly concern of the government and policy-makers about the population problem and contrary to most public perception, eminent economists like T.W. Schultz and P.T. Bauer (1981) questioned the population problem and they considered population explosion to be a myth. They see opportunities rather than problems, who predict that human ingenuity, technological advances and efficient distribution system will usher in golden tomorrow.

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19. Nancy Birdsall, "Relationship of population growth and development," Population and Development Review, Vol. 3, 1977, pp.90.

Between the two extremes are others, approaching the complex relationship from a myriad of different anles postulating a realistic approach.

Following these lines of argument, Grigg (1984) has recently studied changes in the peasant community in pre-industrial Europe. His conclusion is that when most of the cultivable lands are brought under the plough, the peasants try to counteract population pressure by intensifying the land use. Land intensification measures identified by Grigg are:

(i) bringing less fertile land under cultivation;

(ii) increased intensity of cropping, application of more labour inputs per ha. of land per crop season; and

(iii) the formation of capital through the surplus rural labour has been considered as one of the positive effect of population growth. But Grigg has also found that population growth can hardly be considered as an engine of growth leading to higher per capita income.[20]

Ahmed Alia (1984), in case of Bangladesh argues that population is growing independent of the conditions

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20. D.B. Grigg, 'An Introduction to Agricultural Geography', Hutchinson, London, 1983, pp.72-73.

of food supply and the peasant community is trying to adjust food production in response to population growth. Moreover, while population growth provides a positive stimulus to agricultural change by increasing the demand for food and the supply of labour with a time lag, there is a limited scope for increasing output through endogeneous technical changes, and it becomes increasingly difficult to counter a fall in per capita output as the density of population becomes high.[21]

S.K. Ray (1985) also made an attempt to trace the changes induced by population pressure and other factors and the consequent effect of these factors on intensification of land and labour use in crop production; in the plains of Uttar Pradesh. He says if population pressure induces intensification through substitution of labour, capital and skill for land, then the levels of these inputs should, with the passage of time, increasingly move to establish stronger positive association with

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21. Alia Ahmed, Agricultural Stagnation under Population Pressure - the case study of Bangladesh, Vikas, New Delhi, 1984, pp. 45-47.

population density. And he argues that through his study, it was evident that even under growing population pressure on land, the proportion of cultivable area did not record any marked increase between 1951 and 1971.[22] The diversification of rural occupational pattern during the period also showed the limited variation.

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22. S.K. Ray, "Population Pressure and Agricultural Intensification in Uttar Pradesh", Indian Journal of Agricultural Economics, April-June, 1985, Vol.XI, No.2, pp. 105.

CHAPTER-II

POPULATION PROFILE

Rajasthan has a population of about 34 million (1981), spread over an area of 342274 sq.kms. The state accounts for 11.2 per cent of the country's total area and supports only 5 per cent of the total population. This low population pressure is due to the fact that most of the western and north-western parts of the state are arid and semi-arid, covered with stable and shifting sand-dunes. Nearly 80 per cent(1981), of total population lives in villages of various size.

Uneven distribution of population i.e., very low density in western parts and comparatively high in the eastern parts is largely attributed to various physical (i.e. relief and climate) and economic factors (e.g. agricultural productivity). The Aravallis running from north-east to south-west across the state for a length of about 550 kms. serve as a divide. In the west of Aravallis, land is arid and unproductive and hence supports less population; while the east of Aravallis land is plain,comparatively fertile and therefore, thickly populated.

This chapter deals with population distribution, demographic and socio-economic characteristics of population in Rajasthan. Emphasis has been made on cross-sectional and temporal variations in population characteristics.

Table 2.1

Percentage of Rural Population to Total Population

District	Years		Differences
	1971	1981	
1. Jalor	95.6	91.93	-3.67
2. Banswara	94.9	93.77	-1.13
3. Dungarpur	94.1	93.53	-0.57
4. Barmer	92.7	91.22	-1.48
5. Alwar	90.9	88.92	-1.98
6. Jhalawar	90.5	88.34	-2.16
7. Chittor	89.6	86.82	-2.78
8. Bhilwara	89.0	85.61	-3.39
9. Pali	88.8	81.57	-7.23
10. S. Madhopur	88.1	86.58	-1.52
11. Udaipur	87.7	84.93	-2.77
12. Nagaur	80.7	85.44	+4.74
13. Bharatpur	86.2	82.98	-3.22
14. Bundi	85.4	82.99	-2.41
15. Jaisalmer	85.4	86.45	+1.05
16. Ganganagar	83.5	79.39	-4.11
17. Sikar	83.0	79.74	-3.26
18. Jhunjhunun	82.6	79.26	-3.34
19. Tonk	82.6	81.64	-0.96
20. Sirohi	82.1	82.10	+0.00
21. Kota	76.0	68.06	-7.94
22. Churu	70.4	70.77	+0.33
23. Jaipur	70.0	63.44	-6.56
24. Jodhpur	68.1	65.23	-2.87
25. Ajmer	62.4	57.20	-5.2
26. Bikaner	58.6	60.52	+1.92
RAJASTHAN	82.4	78.95	-3.45

fig. 2.1

RAJASTHAN

CONCENTRATION OF POPULATION

1971

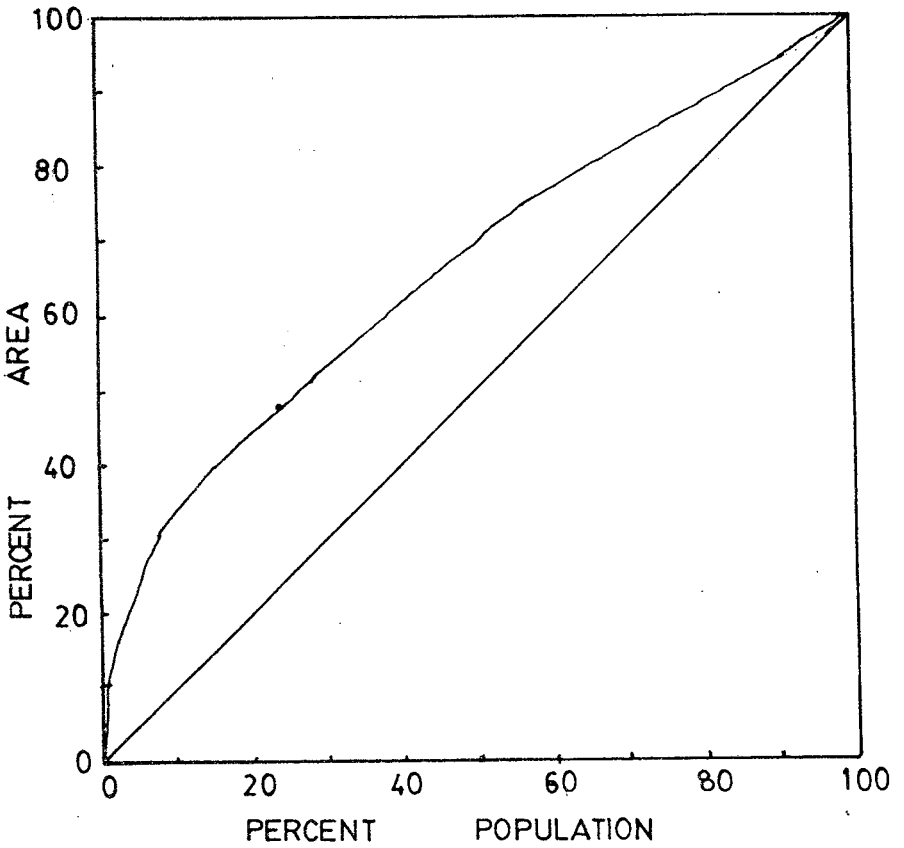
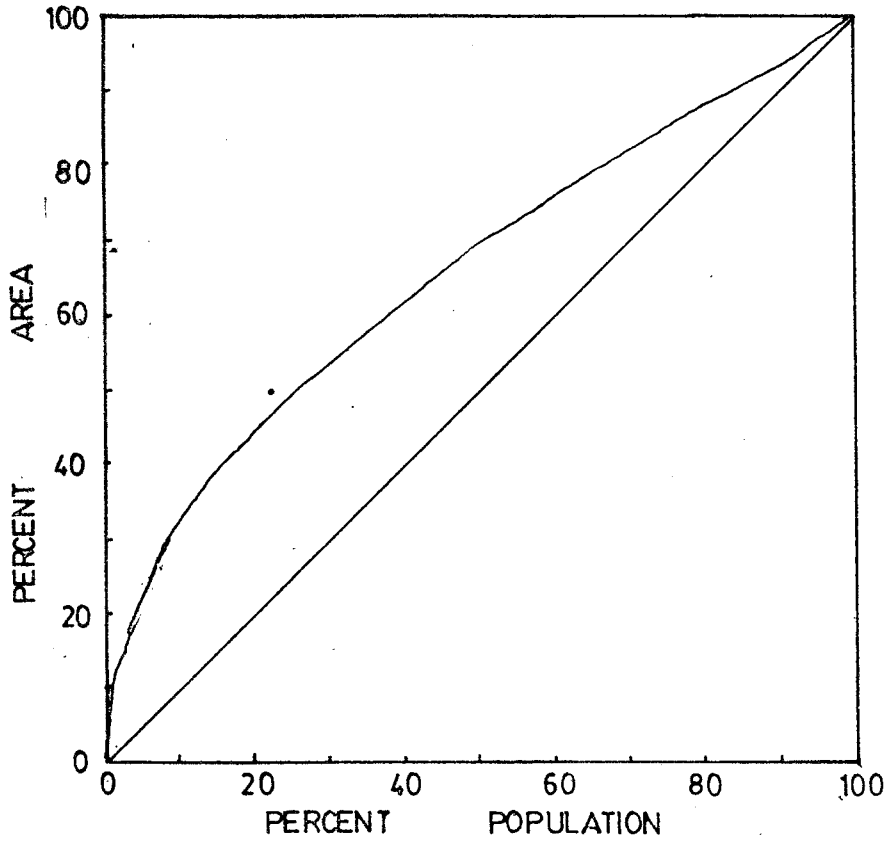


fig. 2.2

RAJASTHAN

CONCENTRATION OF POPULATION

1981



Population Distribution and Density :-

About 70.00 per cent of the country's population live in rural areas. While for the state, Rajasthan, this proportion comes to 79.00 per cent. Proportion of rural population is highest in Banswara (93.77) followed by Dungarpur, Jalor and Barmer. Proportion of rural population has, however, declined over the decade - 1971 to 1981 as evident from Table 2.1. This decline is attributed to faster rate of urbanisation, due to natural growth as well as rural-urban migration.

Concentration of population for both the periods, i.e. for 1971 and for 1981, has been shown by fig. 2.1 and 2.2 which clearly depict the uneven distribution of population. The pattern of concentration in space remains to be almost same as is obvious from the comparison of two lorenz curves of 1971 and 1981.

In 1971, density of rural population in the state was 63 persons per sq. kms. There is a great deal of spatial variations in terms of population density. As revealed in fig. 2.3, the population density tends to decrease as one moves from east to west. The western most districts of the state records the lowest density of rural

fig. 2.3

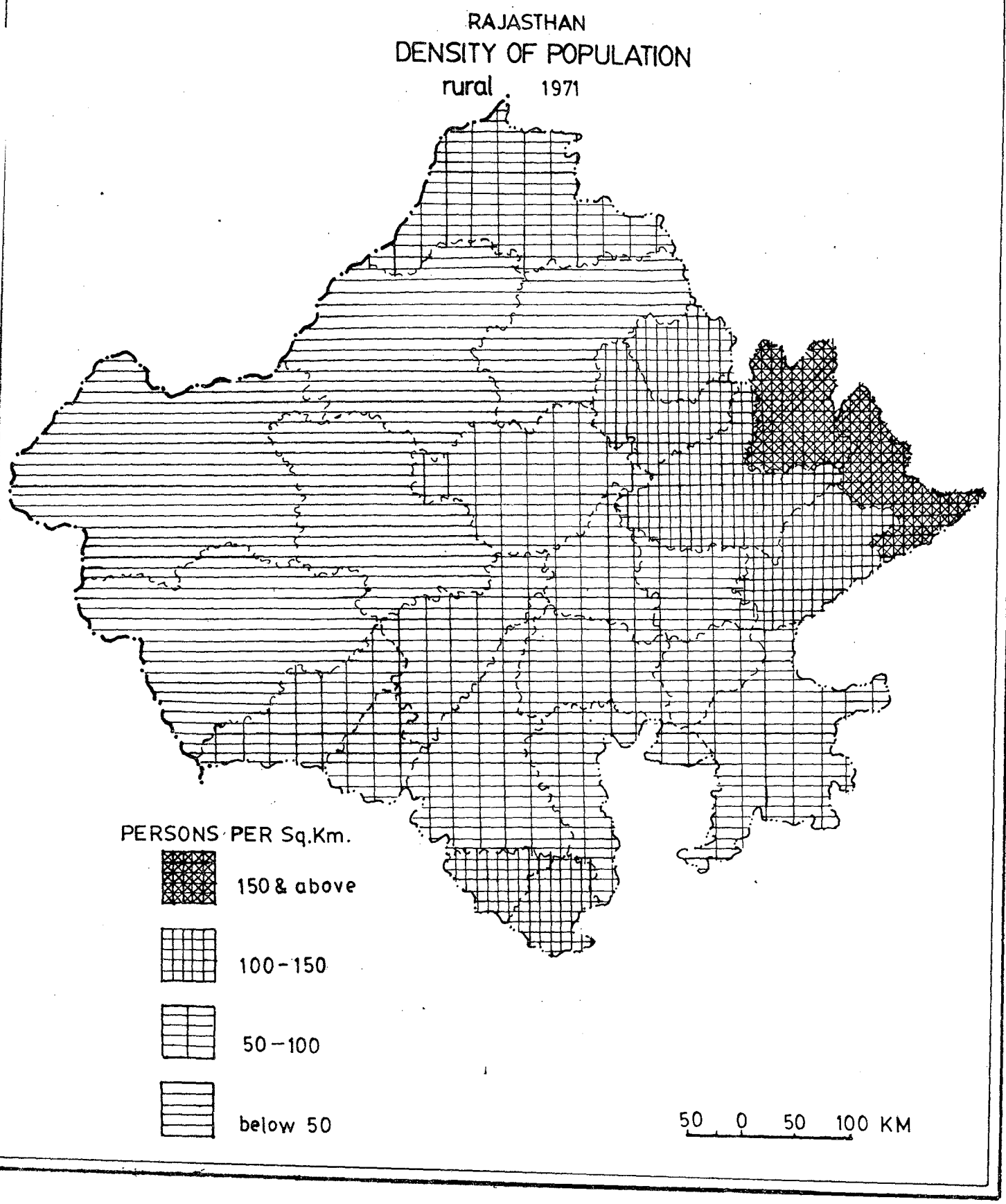
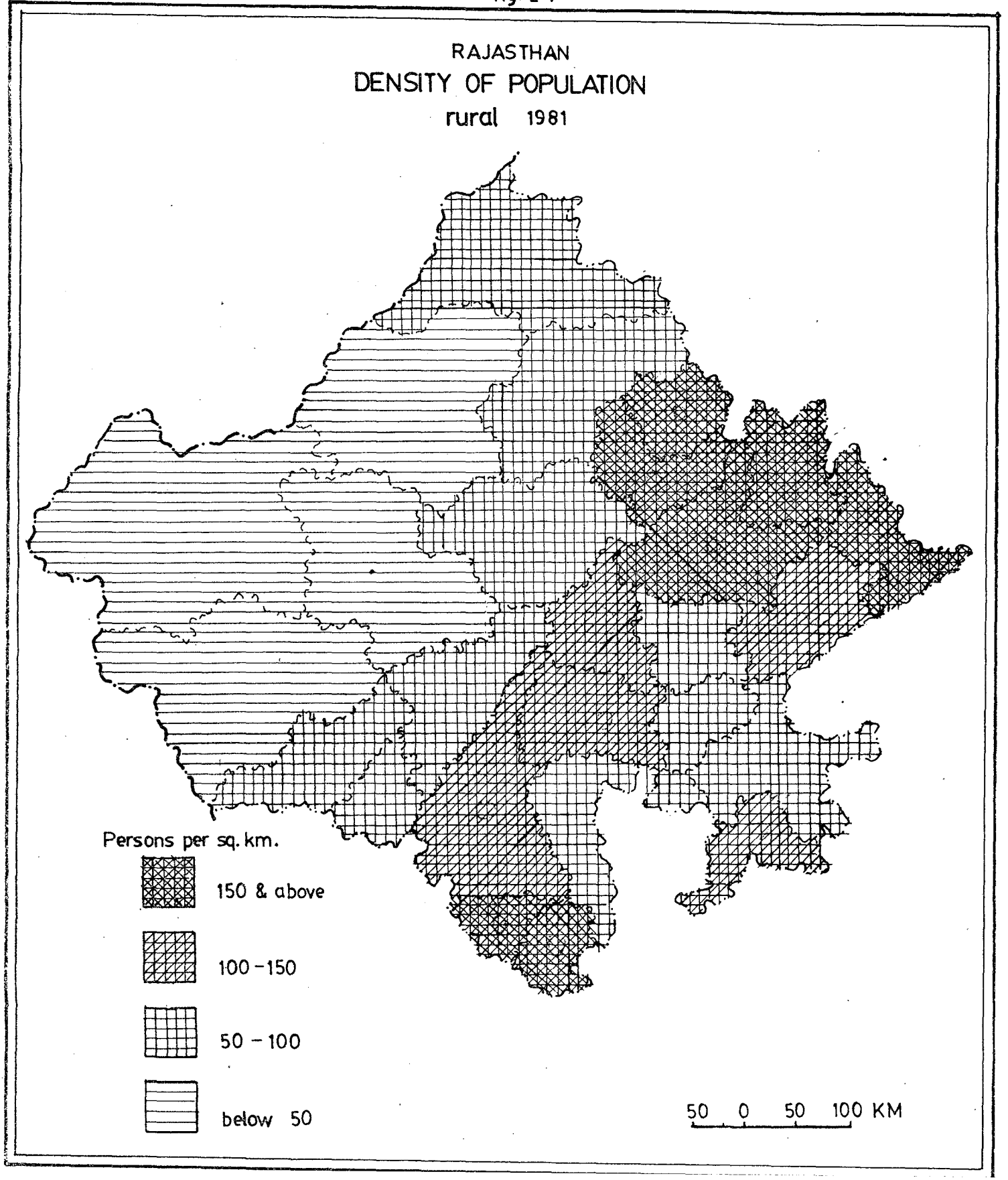

RAJASTHAN
DENSITY OF POPULATION
rural 1971
PERSONS PER Sq.Km.
150 & above
100-150
50-100
below 50
50 0 50 100 KM

fig. 2.4


RAJASTHAN
DENSITY OF POPULATION
rural 1981
Persons per sq. km.
150 & above
100 - 150
50 - 100
below 50
50 0 50 100 KM

population. Districts having highest density of rural population are concentrated in eastern parts of the state, while moderate dense districts lie between the two extremes. In 1971, Bharatpur and Alwar had the highest density of rural population (i.e., 162 and 152 persons per sq. kms. respectively); and the lowest (4 persons/ sq. kms.) was recorded in Jaisalmer.

In 1981, the density of rural population in Rajasthan was 80 persons per sq. kms. Bharatpur, Alwar, Sikar, Jaipur and Jhunjhunun districts which lie in the eastern part of the state; and Dungarpur and Banswara in the south records high rural density (fig. 2.4). The lowest density of rural population (i.e., less than 50 persons/ sq. kms.) is recorded in Barmer, Bikaner and Jaisalmer. Jaisalmer has the lowest density of rural population, i.e.,5 persons per sq. kms.

Over the decade, 1971 to 1981, the rural population density of the state, has increased from 63 persons/ sq.kms. to 80 persons per sq. kms. The change is highest in Sikar district which lie in the eastern part of the state. In 1971, only two districts were in the group of high density i.e., above 150 persons/ sq. kms.; while after a decade 4 other districts also joined them. Dungarpur, Alwar and

Banswara also recorded relatively high change in rural density. Low changes have been recorded in the districts which had already very low density in 1971.

Growth of Population :-

Inspite of the arid and the inhospitable environment, the population in Rajasthan has been steadily increasing. According to 1981 census, Rajasthan has recorded a growth rate of 32.38 per cent over the decade 1971 to 1981 as compared to the national growth rate of 24.75 per cent. The growth in population is generally attributed to three factors: (i) increase in birth rate; (ii) decline in mortality and (iii) migration.

Though the relationship between population growth and other socio-economic variables is to be established in the next chapter, but population growth in Rajasthan in general is attributed to improvement in health and socio-economic conditions which help in curtailment of mortality if not birth rate strictly.

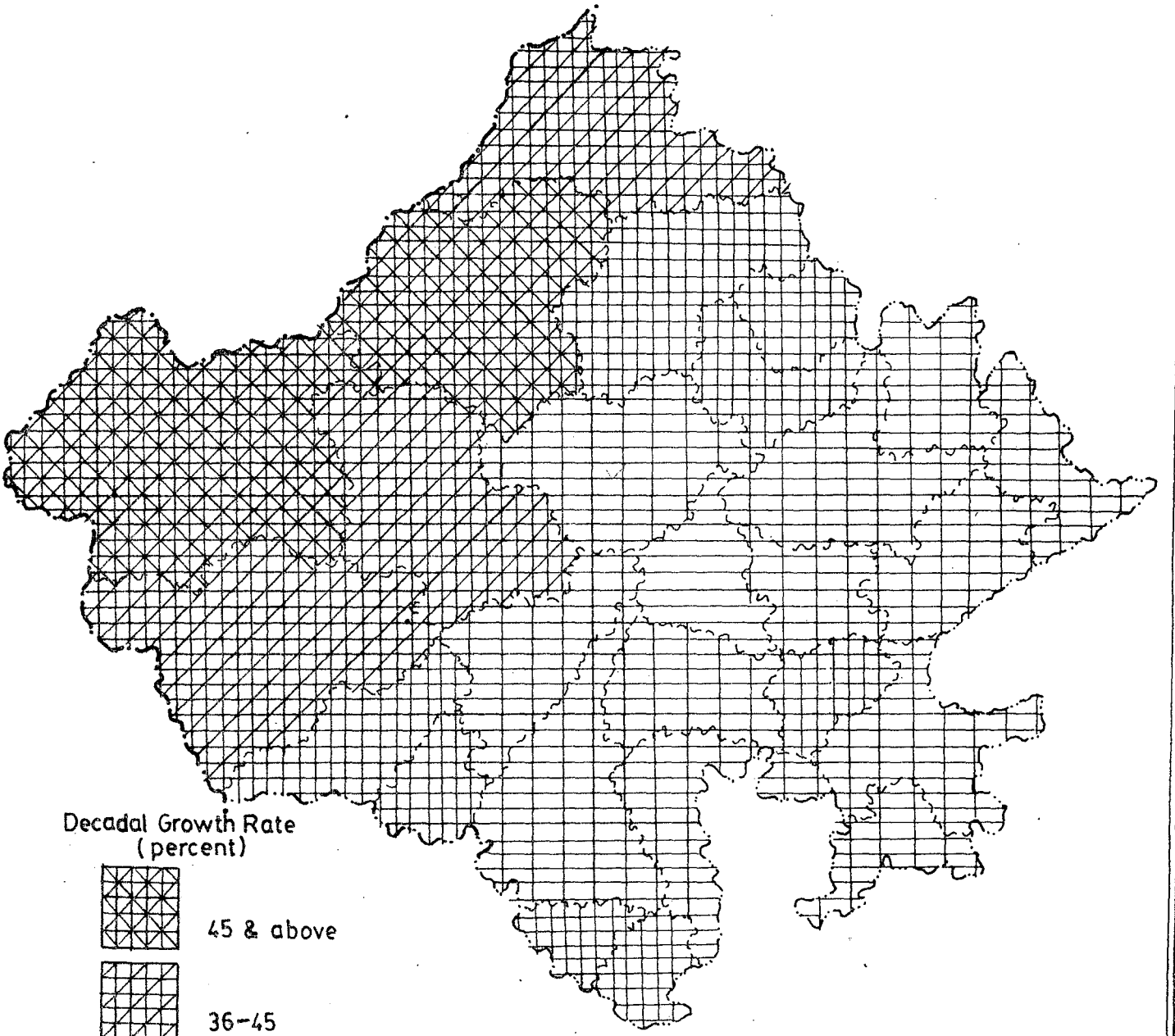
As it is evident from fig. 2.5, the western most districts of the state have recorded the highest growth rates in rural population. It is highest in Bikaner (53 per cent), followed by Jaisalmer (46 per cent). These districts of Rajasthan have very low density of rural

fig. 2.5

RAJASTHAN

GROWTH OF POPULATION

rural (1981 over 1971)



population. Areas of high rural population density recorded moderate growth rates, and lowest has been recorded in Ajmer (15 per cent).

Over last eight decades, i.e. from the beginning of 20th century, the rural folks have multiplied more than three times. During these decades, Ganganagar district recorded the highest growth rate (1082.04 per cent), while the lowest (104.09 per cent) is visible in Bharatpur district.[1]

Socio-Economic Characteristics of Rural Population:

I. Literacy rate :-

As visible in other parts of the country, Rajasthan has remarkable difference in rural and urban literacy rates. Only 17.99 per cent (1981)of rural population in the state were literate.

In 1971, rural literacy rate for the state Rajasthan was 13.85 per cent. Jhunjhunun district recorded the highest rural literacy rate (20.8 per cent), in the state.

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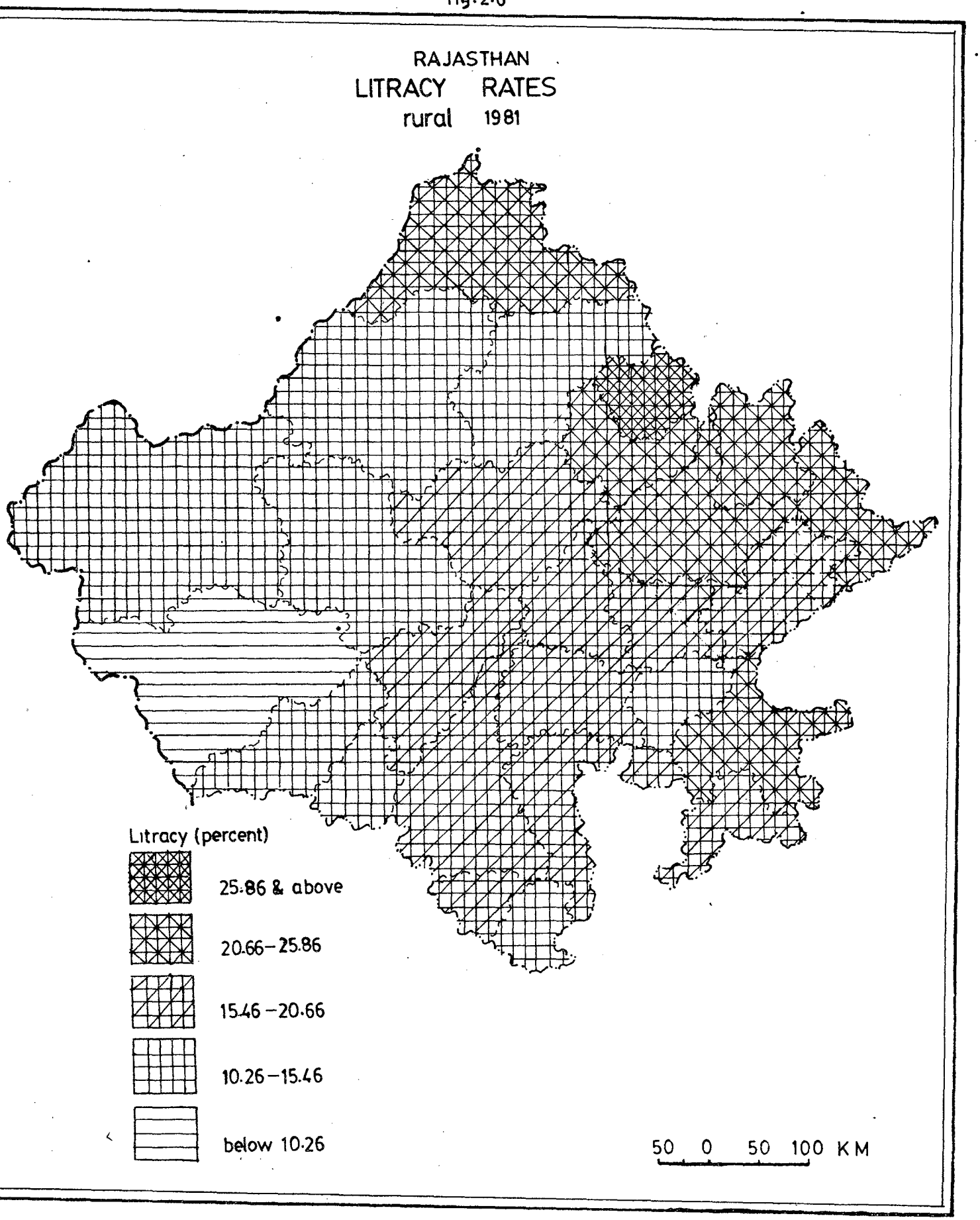
1. Census of India, 1981, Rajasthan, Provisional Population Totals, pp. (xv).

fig. 2.6


RAJASTHAN
LITRACY RATES
rural 1981
Litracy (percent)
25.86 & above
20.66 – 25.86
15.46 – 20.66
10.26 – 15.46
below 10.26
50 0 50 100 KM

It is followed by Kota, Alwar and Sikar respectively. Very low rural literacy rate was recorded in the districts of Barmer, Jalor and Jaisalmer (8.38, 8.73 and 8.95 per cent respectively). In general, the western districts had the lowest literacy levels and in eastern districts, the rate of literacy was comparatively higher.

In 1981, the rate of rural literacy was 17.99 per cent in the state. As evident from fig. 2.6, the eastern districts of the state, mainly Jhunjhunun (25.86 per cent), Alwar (22.86 per cent), Bharatpur (22.23 per cent), Jaipur (20.93 per cent), Kota (20.80 per cent) had comparatively higher rural literacy rate in the state in 1981 also. Rural literacy rate continues to be low in the western parts of the state. Barmer has the lowest literacy rate (9 per cent) in the state.

There has not been any remarkable increase in rural literacy rate in Rajasthan over the decade 1971 to 1981, except Bharatpur, Alwar, Jaipur, Swai Madhopur, and Sikar districts in the east and Ganganagar in the north. Rural literacy continues to be very low in the western Rajasthan (in Jaisalmer, Barmer and Bikaner districts) (see Appendix III).

II. Structure of Working Population:-

Here, we are mainly concerned with the proportion of cultivators and agricultural labourers in total working population and its spatio-temporal variations. But the problem arises in comparability of data, because the criterion for classification of persons as workers has undergone change. The dichotomy of workers/ non-workers of 1971 census has been rightly discarded in 1981 census and a trichotomy of main workers, marginal workers and non-workers was adopted.

In 1971 census, a person was qualified as a worker if he had worked regularly during the work-season or at least for a day in regular work during the week preceeding census taking. While in 1981, the time criterion for engagement in work was the major part of the year, i.e. at least 183 days in the preceeding one year, while those who worked for sometime during the last year but not for the major part of the year were recorded as marginal workers.[2] Certain types of work such as agriculture and household are carried on throughout the year and for this

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2. Census of India, 1981, Rajasthan, Provisional Population Totals, pp. xix to xx.

the broad time-span of the full cycle of agricultural seasons preceeding the enumeration is taken as the reference period (i.e. agricultural workers has been worked out as the main workers).

In 1971, 32.39 per cent of the total rural population in Rajasthan was recorded as workers. Bhilwara had comparatively very high proportion, i.e. 40.33 per cent of workers in total rural population. It was followed by Ajmer (39.87 per cent) and Chittor (39.4 per cent). The eastern districts of the state, i.e. Jhunjhunun, Sikar, Alwar, Bharatpur, Kota and Ganganagar in north, have smaller proportion of working population. The lowest being in Jhunjhunun (26.05 per cent).

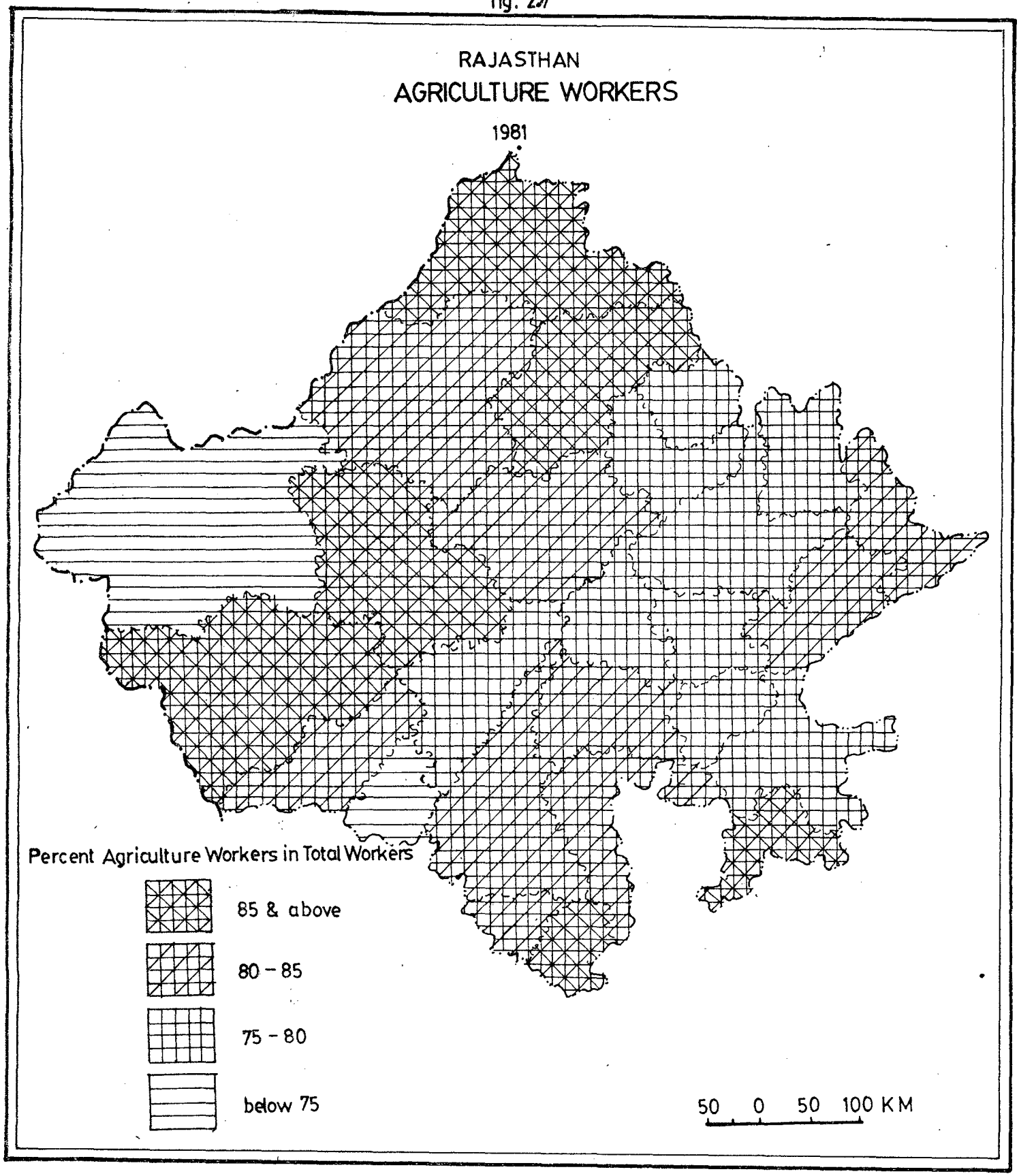
In 1981, proportion of rural working population in total rural population has increased to 36.55 per cent as compared to 32.99 per cent (1971) in Rajasthan. The highest proportion of working population in total population is recorded in Chittor, (47.92 per cent), followed by Bhilwara and Dungarpur (44.72 and 44.42 per cent respectively). The lowest proportion of working population in total population is recorded in Tonk and Sirohi (30.69 and 30.67 per cent respectively).

The proportion of rural workers in total population has increased over the decade 1971 to 1981. The increase for the state is 4.16 per cent. Highest increase has been recorded in the district of Dungarpur (16.19 per cent) and Banswara (13.92 per cent). Tonk and Ajmer districts have recorded negative changes in proportion workers in rural population, i.e. -4.59 and -1.2 per cent respectively. In Bikaner, Jaipur and Swai Madhopur districts, proportion of workers in rural population is stagnant (see Appendix III).

Agricultural workers (cultivators+ agricultural labourers) account for 84.57 per cent (74.23 + 10.34) of total working population in the state, in 1971. The proportion of cultivators in this period was highest in Churu (89.74) followed by Barmer and Banswara (85.05 per cent and 84.24 per cent). Ajmer, Pali and Sirohi districts have recorded the lowest proportion of cultivators, i.e. 58.07, 53.7 and 49.4 per cent respectively.

The proportion of agricultural labourers in total workers was high in Sirohi (23.32 per cent), and Pali districts (21.37 per cent) in 1971. Other districts which had relatively high proportion of agricultural labourers in total workers are Ganganagar (19.78 per cent), Kota

fig. 2.1


RAJASTHAN
AGRICULTURE WORKERS
1981
Percent Agriculture Workers in Total Workers
85 & above
80 - 85
75 - 80
below 75
50 0 50 100 KM

(19.35 per cent) and Jhalawar (17.79 per cent). Districts, which have high proportion of cultivators have low proportion of agricultural labourers and vice-versa. Churu has very low proportion of agricultural labourers in total working population, i.e. 3.93 per cent (see Appendix I).

In 1981, 81.48 per cent of total working population* was classified as agricultural workers (cultivators + agricultural labourers). And, 73.13 per cent of workers were classified as cultivators in 1981. As evident from fig. 2.7, Churu continues to have highest proportion of cultivators in total workers (88.86 per cent). Jodhpur and Barmer in western parts and Banswara in southern parts are other districts where cultivators account for more than 80 per cent of total work-force. Sirohi has again lowest proportion of cultivators, i.e. 50.14 per cent. Pali and Kota are other southern districts where cultivators account less than 60 per cent of total workers.

8.35 per cent of total workers are engaged as agricultural labourers in the state. Sirohi which has lowest proportion of cultivators has highest proportion of agricultural

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*Proportion of agricultural workers has been determined from total main-workers.

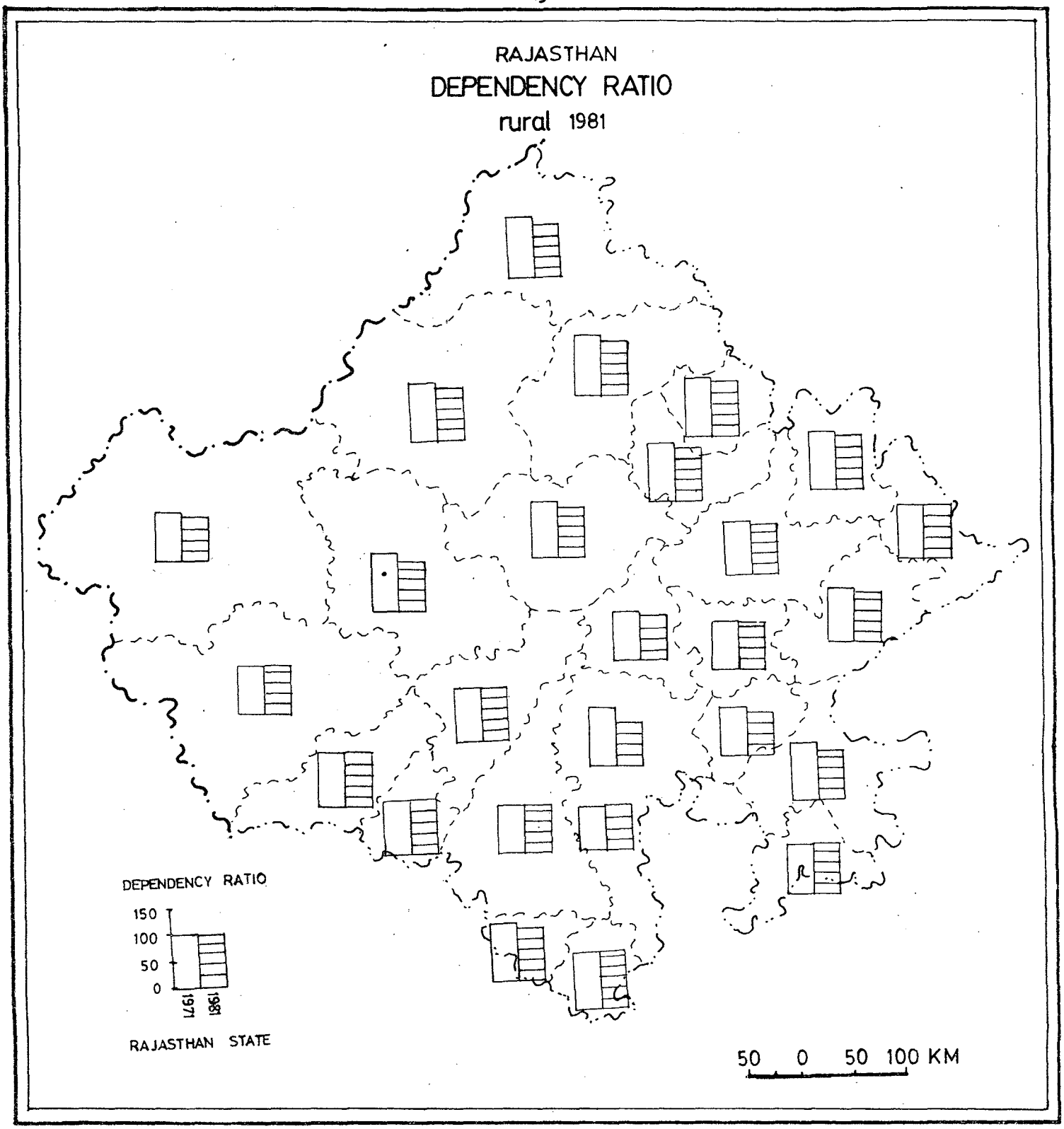
labourers (18.63 per cent) in the state in 1981. Ganganagar, Pali, Kota and Jhalawar are other districts where proportion of agricultural labourers in total workers is more than 15 per cent. Again, Churu which has highest proportion of cultivators has lowest proportion of agricultural labourers in Rajasthan. Bikaner, Jhunjhunun, Sikar, Barmer and Jaisalmer are also other districts where less than 5 per cent of main workers are classified as agricultural labourers.

But the figures of cultivators and agricultural labourers in 1981 are not comparable with 1971 figures. This is because of definitional changes in the concept of work itself. Though the figures of total working population can be made comparable by adding together main workers and marginal workers of 1981 to compare with that of workers of 1971. But in 1981, marginal workers have not been categorised according to industrial categories. Hence, it is not possible to determine total workers engaged in agriculture and compare it with respective figures of 1971 census.

III. Dependency ratio of Rural Population:-

The dependency ratio is a measure for assessing the economic dependency of population. Though it is not a completely accurate measure for assessing the dependency burden, for not all persons in the working age are employed,

fig. 2.8


RAJASTHAN
DEPENDENCY RATIO
rural 1981
DEPENDENCY RATIO
150
100
50
0
1971
1981
RAJASTHAN STATE
50 0 50 100 KM

nor all those in the dependent age are economic dependents; yet, this measure gives us a broad idea of dependents, and is, therefore, widely used.

In Rajasthan, dependency ratio of rural population is quite high. It is recorded 100 in 1981. Banswara district recorded the highest dependency ratio of rural population in Rajasthan, i.e. 110 in 1981. As evident from fig. 2.8, other districts which have dependency ratio more than that of Rajasthan state are Alwar, Bharatpur, Bikaner, Churu, Jalor, Jhunjhunun and Sirohi. Bhilwara records the lowest dependency ratio in the state, i.e. 82.

Dependency ratio of rural population in Rajasthan is almost constant as it was 101 and 100 in 1971 and 1981 respectively. It has declined marginally in most of the districts. Dependency burden has increased in Jalor, Tonk, Jhalawar and Udaipur. Bhilwara has recorded decline in this ratio from 111 to 82 over the period, 1971 to 1981.

CHAPTER-III

REGIONAL PATTERN IN AGRICULTURE

This chapter deals with the spatio-temporal variations in the patterns of land-utilization, corpping pattern, levels of agricultural productivity and modern agricultural inputs.

A. Land Utilization Pattern:-

As Dudley Stamp says, that utilization of land resources depends upon a number of factors which can broadly be classified as follows:

(i) Physical - This includes topography, climate, soil, geology, and vegetation, etc.

(ii) Economic - It includes monetary system, credit and capital, trade, commerce, technology, etc.

(iii) Institutional - This includes cultural environment social action, value system and legal system.[1]

Physical factors, particularly climate, relief and soils, play very important role in determining agricultural

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1. Quoted from D.S. Chauhan, "Studies in utilization of agricultural land", Educational Publishers, Agra, 1966, p. 25.

landuse pattern in Rajasthan. Western Rajasthan, where rainfall is scanty and land is studded with shifting sand-dunes, proportion of cultivable waste and fallow land is very high (around 77 per cent in Jaisalmer and 51 per cent in Bikaner, 1980-81). But landuse pattern can change dramatically with the help of institutional and technological factors - such as introduction of irrigation facilities in Ganganagar district had ushered increase in net sown area and area sown more than once, thereby bringing fallow land under cultivation.

High percentages of area lying as culturable waste is mainly confined to areas with marked water scarcity, marked accumulation of sand or both. While, in areas where irrigation has been introduced or water supply is reliable the culturable waste has been mostly reclaimed.[2]

Forests covered about 6.00 per cent of the total geographical area in the state in 1980-81 (Appendix V). Area put to non-agricultural uses is 4.4 per cent. Culturable waste land and fallow land, account for 18.52 per cent and

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2. A. Ahmed, "A Geographical Approach to the Process of land-use, The Indian Desert", Geographer, 15, 1968, pp.

13 per cent of total geographical area of the state. Net sown area accounts for less than half, i.e. 43 per cent of the total geographical area. High proportion of total geographical area is barren and non-cultivable, in Bhilwara, Bundi, Chittorgarh, Banswara, Dungarpur, Swai Madhopur, Sikar and Udaipur districts. This is because of the fact that it is a hilly tract and Aravalli ranges covers a large area in this region.

(i) Forests:-

In 1970-71, around 4.00 per cent of the total geographical area was under forests. A high proportion of the area under forests was recorded in the southern districts of the state, namely Dungarpur (17.86 per cent), Banswara (16.33 per cent), and Udaipur (15.25 per cent), alongwith two eastern districts of Kota (18.87) and Swai Madhopur (17.37 per cent). In the north and western districts of Rajasthan, area under forests is negligible, i.e. less than one per cent of total geographical area (see Appendix IV).

During the period 1980-81, forests covered 6.07 per cent area in the state. As evident from fig.(3.1), area under forests was high in the districts of Sirohi (27.64

per cent), Kota (25.97 per cent), and Bundi (22.40 per cent). Again, the southern districts - Banswara, Dungarpur, Udaipur and Jhalawar and eastern districts of Swai Madhopur had 17 to 20 per cent of area under forests. Barmer, Churu, Jodhpur, Nagaur, Bikaner, Jaisalmer, Sikar, Jalor, and Ganganagar had less than 2 per cent of area under forests.

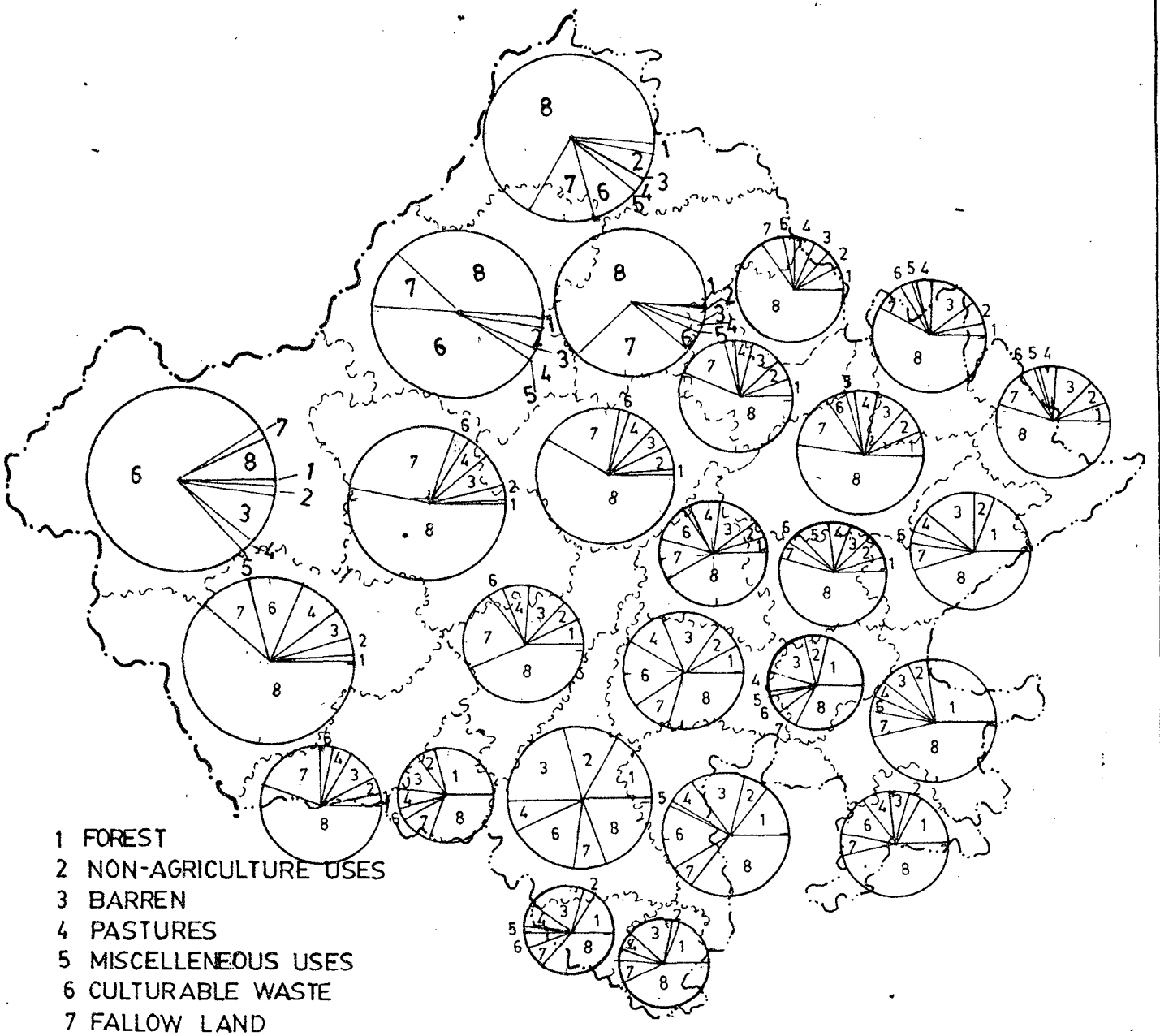
Over the period 1970-71 to 1980-81, the proportion of area under forests has increased from 3.99 per cent to 6.07 per cent in the state. The change is very striking in the districts of Sirohi (9.29 per cent to 24.64 per cent), Jhalawar (6.87 to 16.73 per cent), Bundi (5.39 to 22.4 per cent) and Chittor (6.38 to 13.33 per cent). Area under forests is stagnant in north-eastern districts of Alwar, Jhunjhunun, Sikar and in Ajmer. In the remaining districts, area under forests has increased slightly. Proportion of area under forest varies in space in accordance with variations in rainfall.

(ii) Culturable waste land:-

A high percentage i.e., about 19 per cent culturable waste is a significant proportion of the existing landuse pattern in the state. About 96 per cent of the cultivable waste land of Rajasthan is concentrated in the 5 districts

fig. 3.1

RAJASTHAN
LAND USE
1980–81



of 'Thar' desert (viz. Ganganagar, Bikaner, Churu, Barmer and Jaisalmer).

During 1970-71, Bikaner accounted for very high proportion (63.45 per cent) of cultivable waste, followed by Jaisalmer (47.55 per cent). In the two southern districts of Bhilwara and Chittorgarh (27.2 and 27.73 per cent respectively) of their area was recorded as culturable waste. Nagaur, Pali, Jalor, and Swai Madhopur had very low proportion of culturable waste land, i.e. less than 1 per cent.

The proportion of culturable waste land remains stagnant over the decade (1970-71 to 1980-81) in the State. However, spatial analysis reveals that its proportion has declined in all the districts of the state except Jaisalmer, where it has increased from 47.55 to 77.01 per cent. This speaks of deteriorating agricultural land because of wind erosion and dependency on scanty and unreliable rainfall in Jaisalmer.

(iii) Fallow land:-

Fallow land is also cultivable land, but because of low fertility of the soils, it cannot be cultivated continuously. Such land is left fallow until it regains the

soil nutrients it lacks. Thus, such land is not available for cultivation for one year to five years. If this land is not able to regain its fertility even after 5 years, it is accounted as culturable waste. Culturable waste can be made cultivable by using manures and chemical fertilizers and watering and applying gypsum in case it is alkline and saline.

Rajasthan has a fairly high proportion (i.e. 13 per cent) of fallow land, which includes current fallow and other than current fallow. Keeping the culturable land fallow is widely practised in all arid and semi-arid regions of Rajasthan as an effective measure of land management.

During the period 1970-71, fallow and covered 12.66 per cent of total geographical area in Rajasthan. In the western districts of Rajasthan, i.e. Barmer (32.3 per cent), Jodhpur (31.66), Pali (25.48) and Jalor (22.97 per cent), districts had a very high proportion of fallow land during the period 1970-71. The lowest proportion of fallow land was recorded in Alwar (1.89 per cent), Kota (2.86 per cent), Swai Madhopur (2.75 per cent), Bharatpur (3.36) and Jhalawar (2.53 per cent) districts in the eastern part of the state.

During the period 1980-81, Rajasthan recorded 13.1 per cent of total area as fallow land. Jaipur (30.04 per cent), Jalor (23.00 per cent), Pali (22.94), Nagaur (21.17) and Churu (20.47 per cent) districts had very high percentage of fallow land. Jaisalmer (2.37 per cent), Jhalawar, Chittor, Udaipur and Kota districts recorded very low percentages of fallow land in the state.

Percentages of fallow land has decreased markedly in the districts of Barmer (from 32.29 to 9.66 per cent), over the decade 1970-71 to 1980-81. It has also decreased marginally in the districts of Pali, Banswara and Ganganagar. In the districts of Tonk, Sikar, Nagaur, Jaipur, Dungarpur, Churu, Bharatpur, Alwar and Ajmer, percentages of fallow land has increased. This increase is very high in Alwar district (from 1.89 per cent to 8.19 per cent). This is because of rainfall fluctuations in late seventies.

(iv) Net sown area:-

Proportion of net sown area to total geographical area denotes the extent to which the available land resource has been utilized for agriculture purposes. In Rajasthan, about 43.00 per cent of the total area is utilized for raising crops. This actually indicates the fact that land

resource in Rajasthan has not been fully utilized. Proportion of net sown area is highest (1970-71) in north-eastern parts of the state - Jhunjhunun (76.41 per cent), Churu (71.32), Sikar (70.93), Nagaur (68.43), Bharatpur (65.6), Alwar (64.52) and Tonk (63.18 per cent) districts. Proportion of net sown area is lowest in Jaisalmer (3 per cent), followed by Udaipur. Low proportion of net sown area in western and southern parts of Rajasthan is also attributed to low fertility of soil and rugged relief due to presence of Aravalli hills.

As evident from fig.(3.1), during the period 1980-81, net sown area covered 43.86 per cent of total area of the state. Proportion of net sown area was high in the eastern part of the state, i.e. Bharatpur, Alwar, Jhunjhunun, Sikar and Tonk districts (above 60 per cent). This is because of introduction of canal irrigation, that the proportion of net sown area in total geographical area had increased to 68.36 per cent in Ganganagar district in 1980-81.

Net sown area in Rajasthan has remained constant and did not show any marked growth over the period 1970-71 to 1980-81. Proportion of net sown area in the state was

42.47 per cent and 43.88 per cent in 1970-71 and 1980-81 respectively. Its proportion has remained stagnant in the districts of Chittor, Jalor, Jhalawar and Pali. But, it has increased in the districts of Ganganagar (60.98 to 68.36 per cent), Barmer (37.18 to 52.21 per cent), Banswara (39.9 to 41.9 per cent), and in Jodhpur (50.0 to 51.6 per cent). In the remaining districts, the proportion of net sown area has shown decline.

II. Intensity of Cropping:-

Intensity of cropping is the indicator of vertical extension of area under cultivation. It shows how intensively the net sown area is cropped. Intensity of cropping is very low in Rajasthan. It was 116.12 per cent in 1980-81. This is because of scanty and unreliable rainfall and meagre growth of irrigation facilities. In 1970-71, cropping intensity in the state was even low (110 per cent). Intensity of cropping is relatively higher in eastern and southern parts of the state, i.e. in Alwar, Dungarpur, Udaipur, Bhilwara and Chittorgarh districts, where normal annual rainfall is comparatively higher. While in the desert area, where rainfall is hardly sufficient for the cultivation of kharif crops, it is not possible to sow area more than once.

fig. 3.2

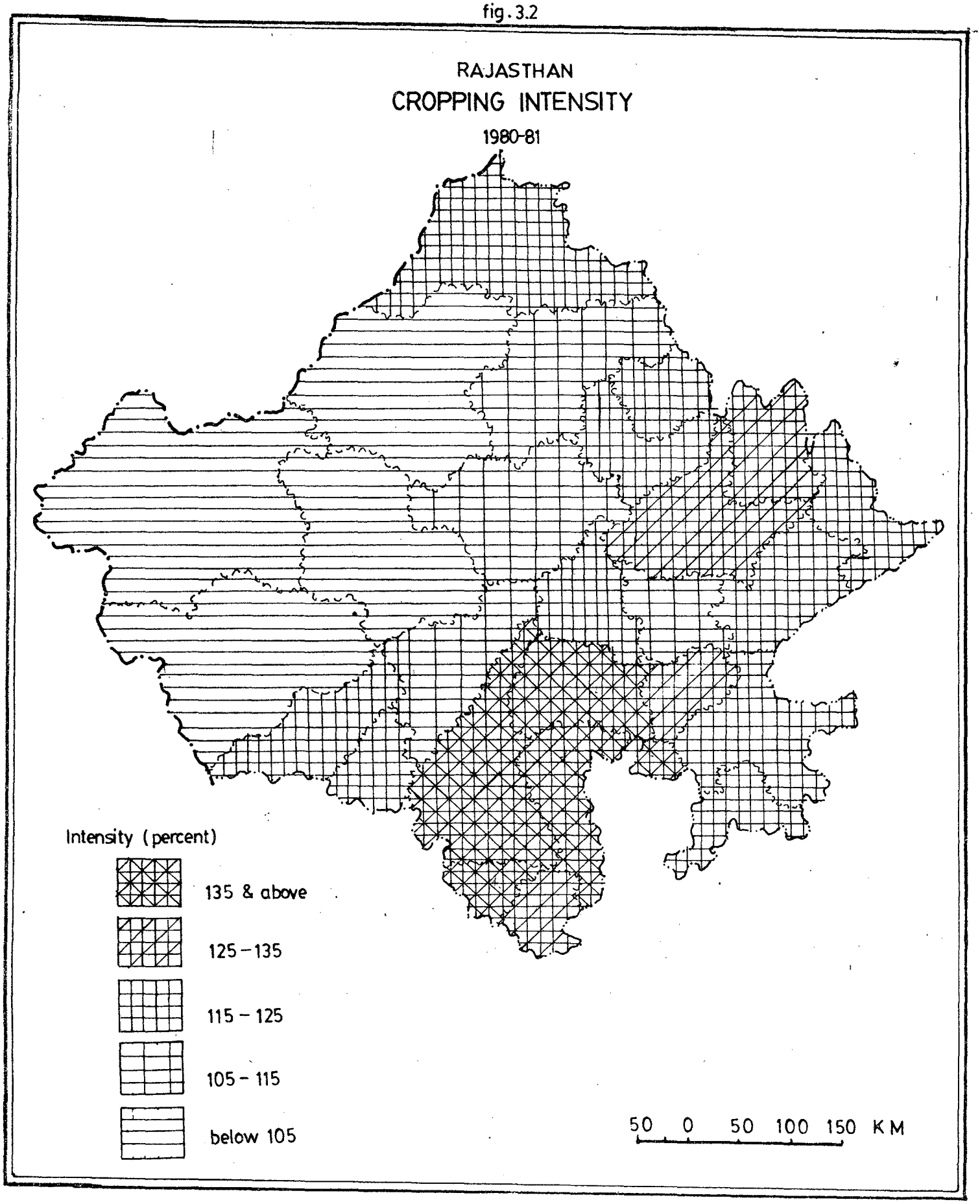

RAJASTHAN
CROPPING INTENSITY
1980-81
Intensity (percent)
135 & above
125 – 135
115 – 125
105 – 115
below 105
50 0 50 100 150 KM

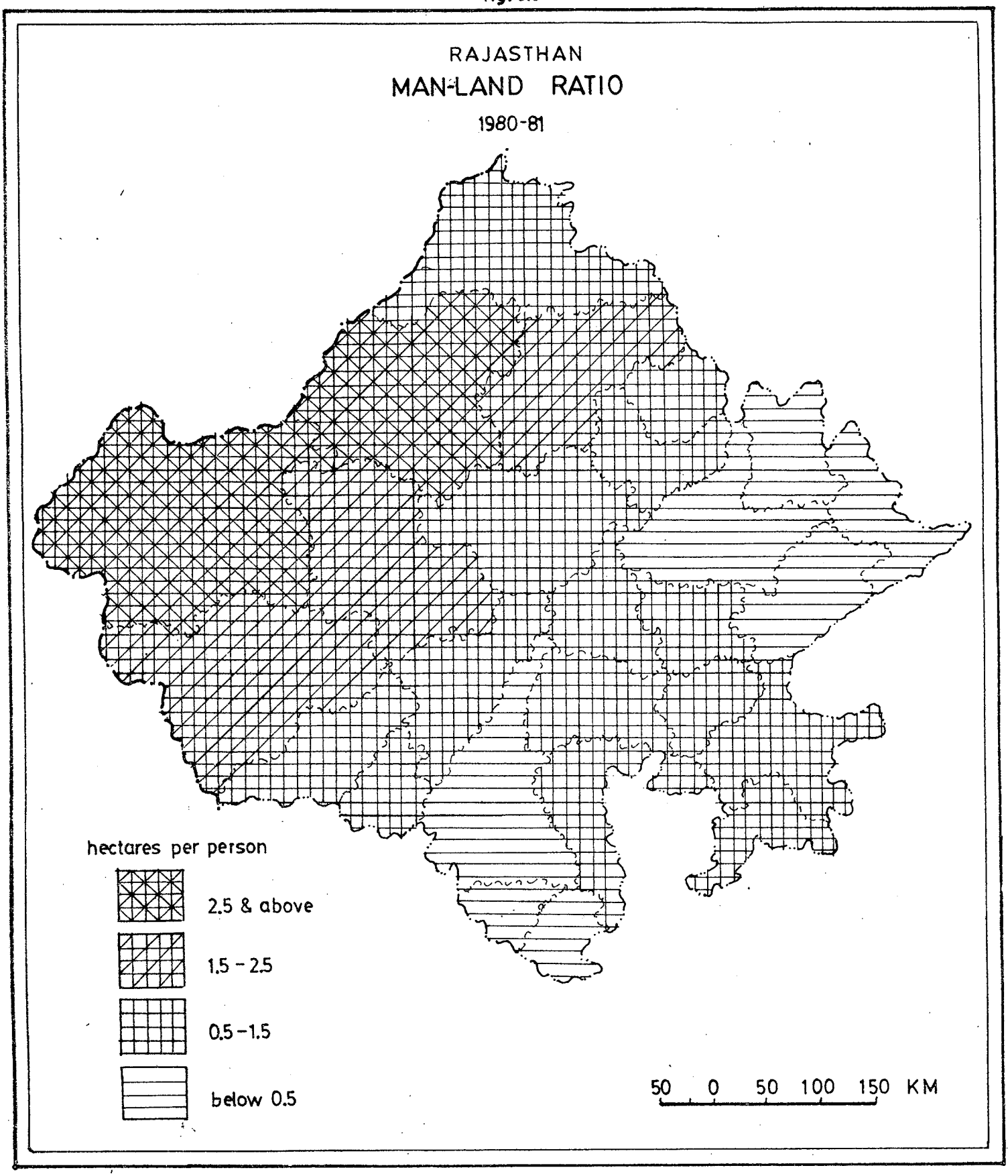
Fig.3.2 shows spatial variations in level of cropping intensity. It is highest in Udaipur district (147 per cent), followed by Chittor, Dungarpur, Banswara and Alwar in the eastern part of the state. The western districts of the state - Jaisalmer, Jodhpur, Bikaner and Barmer have low intensity of cropping in Rajasthan.

Cropping intensity has increased from 110 per cent to 116 per cent in Rajasthan over the period 1970-71 to 1980-81. The change is highest in southern Rajasthan, i.e. Banswara district (17 per cent), followed by Chittor, Udaipur and Ganganagar. Other districts, where intensity of cropping has shown marked positive changes are Jalor, Bundi and Jhunjhunun. In Alwar, the change is negative (-3 per cent) whereas, it is constant in the districts of Jaisalmer and Bharatpur.

III. Land-Man ratio:-

Land-man ratio is an indicator of pressure of population on agricultural land resources. It shows the relationship between land and human resources. The population density is simply arithmatical and it refers only to quantitative relationship between number of

fig. 3.3


RAJASTHAN
MAN-LAND RATIO
1980-81
hectares per person
2.5 & above
1.5 - 2.5
0.5 - 1.5
below 0.5
50 0 50 100 150 KM

people and number of units of land area- in acres, sq. miles, etc.

The concept of land-man ratio is a refinement of the concept of population density. It includes both quantitative and qualitative relationship between man and land. Land-man ratio indicates a ratio between Human population and arable land, (i.e. Acres/Hectares of land per person). The arable land, has been defined as land that is normally used for agricultural production, and it is the sum of net area sown, land under miscellaneous tree crops, cultivable waste land and fallow land.[3]

Land-man ratio was 1.18 ha. in Rajasthan in 1970-71 (Appendix VI). Jaisalmer had highest land-man ratio, i.e. 14.77 ha., followed by other districts of western Rajasthan - Bikaner (7.69 ha.), Barmer, Churu and Jodhpur. Per head arable land was low in the southern districts of Dungarpur (.34 ha.), Banswara (.46 ha.), Udaipur (.42 ha.), and in the eastern districts of Alwar, Bharatpur and Swai Madhopur.

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3. P.G.K. Panikar, Krishnan and Krishnaji, "Population growth and agricultural development, A case study of Kerala", Centre for Development Studies, Trivandrum, 1977, p. 7.

Land-man ratio has declined from 1.8 ha. to .95 ha. from 1970-71 to 1980-81, in the state. As evident from fig.(3.3), Jaisalmer continues to have highest land-man ratio (15.76 ha.). Other districts of western Rajasthan also have high land-man ratio. Land-man ratio is low in south and south-eastern Rajasthan where population pressure is high and proportion of cultivable land is low because of the presence of Aravalli hills.

Availability of arable land, per head of rural population has declined all over the state except Jaisalmer district. The ratio has declined because of the fact that growth rate of rural population has edge over growth rate of arable land in the state.

B. CROPPING PATTERN:-

During 1980-81, bajra covered around 27 per cent of total cropped area in the state. Wheat is second ranking crop occupying 10 per cent in gross cropped area. Other important crops of Rajasthan are gram, jowar and maize, which covers 8.6, 5.4 and 5.2 per cent of total cropped area respectively in Rajasthan.

(i) Crop-combination Regions:-

Crop combination analysis constitute an important part of agricultural study as crops are mostly sown in combination and portray variations because of various physical and socio-economic factors. Fig.3.4 and 3.5 shows crop combination regions of the state, demarcated by Doi's method.

As evident from fig.3.5, on the basis of first ranking crop (1980-81), Rajasthan, can be divided as: (i) Maize dominated region - includes southern region; (ii) Jowar dominated region - south-eastern region; (iii) Gram dominated region - Ganganagar district; and (iv) Bajra dominated region - western (desert) region and Alwar, Bharatpur and Swai Madhopur districts of eastern Rajasthan.

Bajra is a dominant crop in 14 districts of Rajasthan, (see table 3.1) and it is monoculture in Jaisalmer district because it is a drought resistant crop. Kharif pulses (moth and moong) and fodder crop - gauar are other important crops in western districts (Bikaner, Churu, Barmer, and Ganganagar).

fig. 3.4

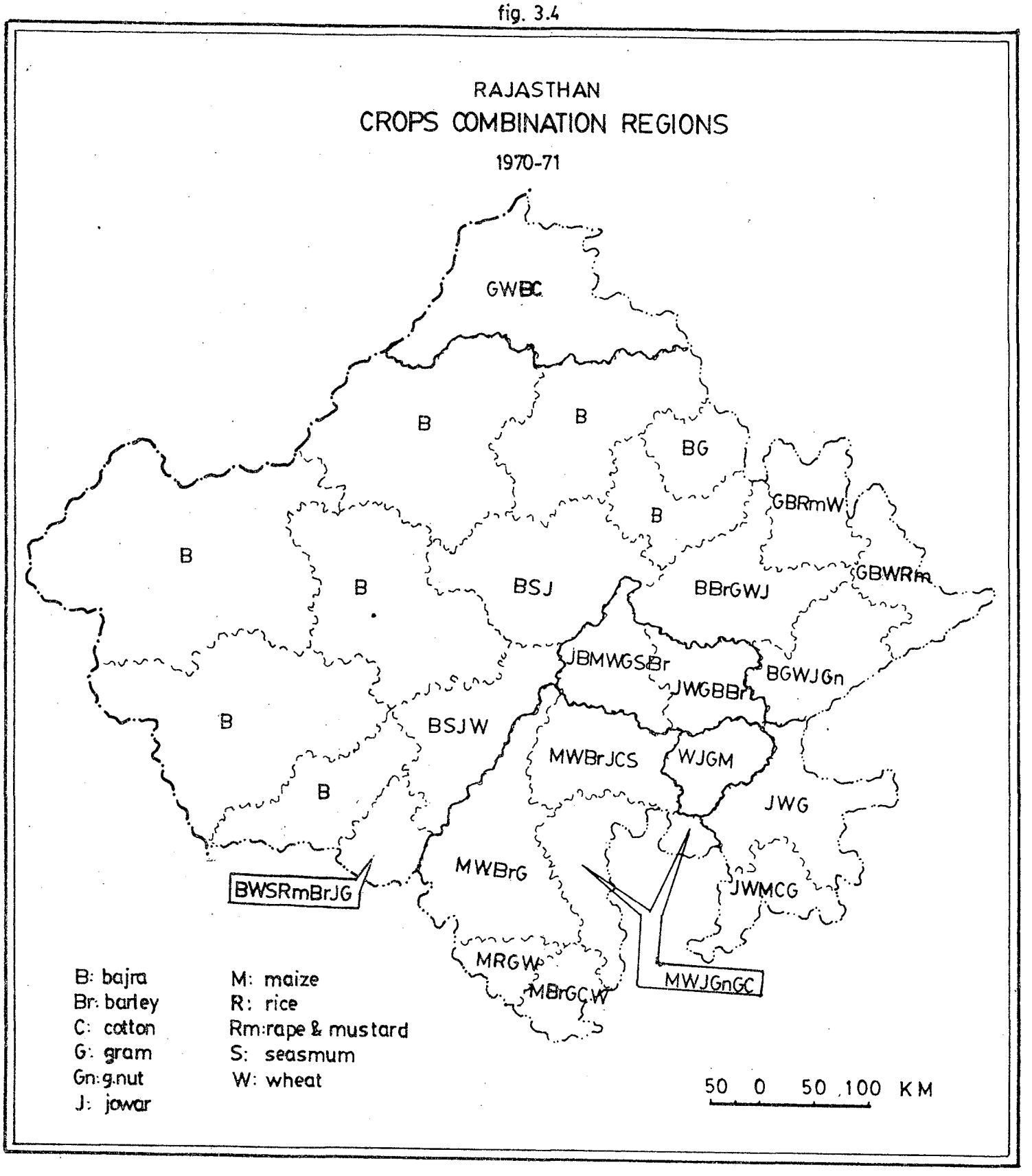

RAJASTHAN
CROPS COMBINATION REGIONS
1970-71
GWBC
B
B
BG
B
GBRmW
B
B
BSJ
BBrGWJ
GBWRm
JBMWGSBr
BGWJGn
JWGBBr
B
BSJW
MWBrJCS
WJGM
B
JWG
MWBrG
BWSRmBrJG
JWMCG
MRGW
MBrGCW
MWJGnGC
B: bajra
Br: barley
C: cotton
G: gram
Gn: g.nut
J: jowar
M: maize
R: rice
Rm: rape & mustard
S: seasmum
W: wheat
50 0 50 100 KM

fig. 3.5

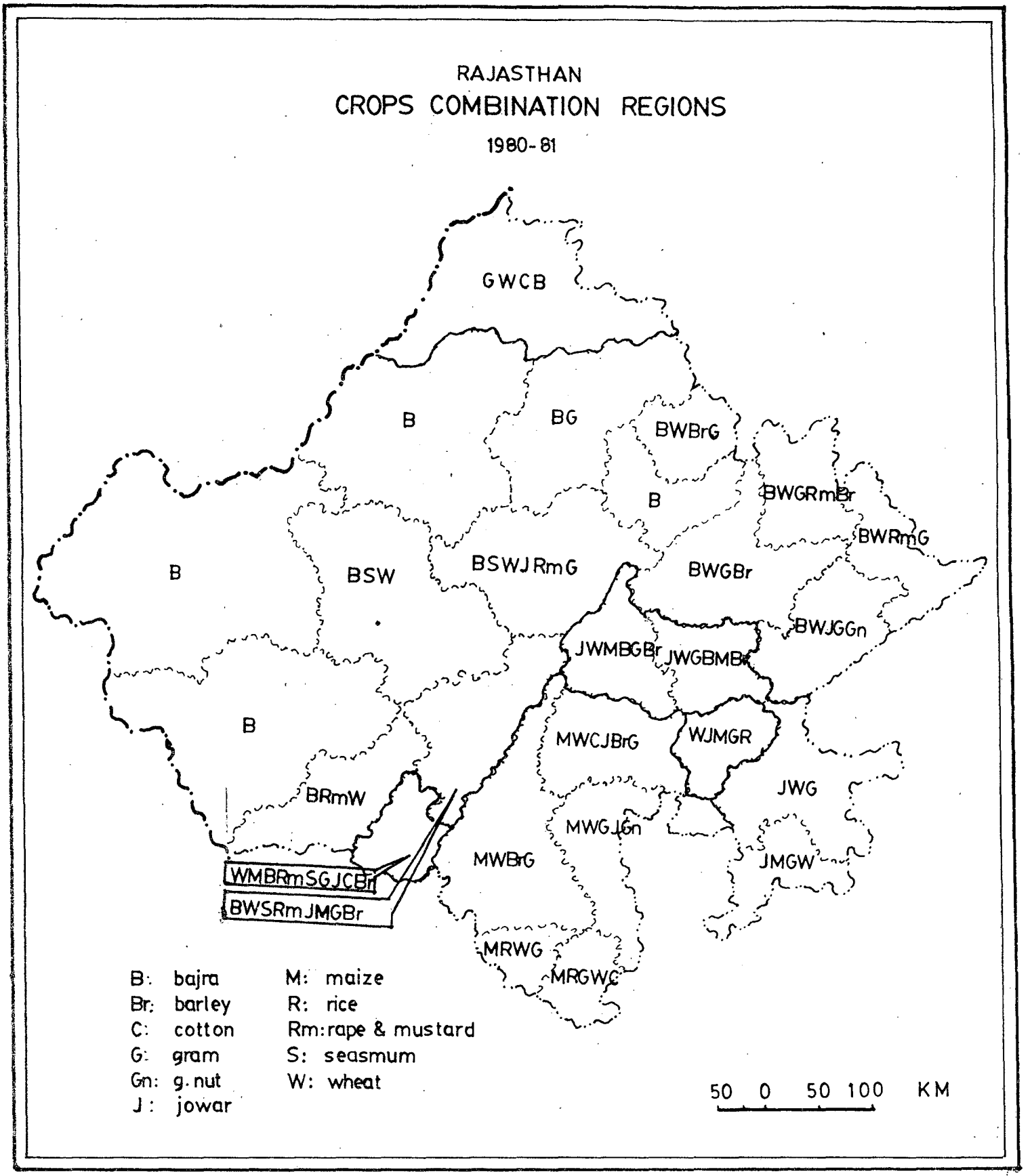

RAJASTHAN
CROPS COMBINATION REGIONS
1980-81
GWCB
B
BG
BWBrG
B
BWGRmBr
BWRmG
B
BSW
BSWJRmG
BWGBr
BWJGGn
JWMBGBr
JWGBMBr
B
MWCJBrG
WJMGR
BRmW
JWG
MWGJGn
MWBrG
JMGW
WMBRmSGJCBr
BWSRmJMGBr
MRWG
MRGWC
B: bajra
Br: barley
C: cotton
G: gram
Gn: g.nut
J: jowar
M: maize
R: rice
Rm: rape & mustard
S: seasmum
W: wheat
50 0 50 100 KM

Table 3.1

First Ranking Crops

Crops	Number of Districts 1970-71	1980-81
Bajra	13	14
Maize	5	5
Jowar	4	4
Gram	3	1
Wheat	1	2

As evident from Table 3.2 and fig.(3.4 and 3.5), that crop-diversification increases as one moves from west to east. While bajra is almost a monoculture in western parts of Thar desert, it is grown in combination with seasmum, wheat and jowar in central and south-western part of Rajasthan. In the eastern parts of the state, bajra is sown in combination with wheat, gram, rape and mustard, and jowar, etc.

Table 3.2

Crop-combinations	Number of Districts 1970-71	1980-81
One crop	7	4
Two crops	1	1
Three crops	2	3
Four crops	7	7
Five crops	5	5
Six crops	3	4
Seven crops	1	-
Eight + crops	-	2

As evident from fig.(3.5) gram, which is a dominant crop in Ganganagar district, is sown in combination with irrigated crops - wheat and cotton except bajra which is mostely unirrigated. Jowar is dominant crop in south eastern part of the state, and is sown in combination with wheat, maize and gram etc. Maize is a dominant crop in southern parts of the state which is grown in combination with wheat, cotton, jowar, barley in Bhilwara; and gram, wheat, barley and jowar in Udaipur and Chittor districts. In Dungarpur and Bhilwara districts, maize combines with wheat, rice and gram. Wheat is a dominant crop in Sirohi. Here, it is sown in combination with maize, bajra, rape and mustard, seasmum and gram, etc. While in Bundi, wheat is sown in combination with jowar, maize, gram and rice. While, it is monoculture in Jaisalmer, there are 8 and 9 crops combination in Udaipur and Sirohi districts.

Comparison of fig. 3.4 and 3.5 reveals that cropping pattern had been diversified over the period 1970-71 to 1980-81. Number of districts having monoculture has declined from 7 to 4 and number of districts having 6 or more number of crops has increased from four to six.

C. Agricultural Production and Productivity:-

(i) Temporal variations in production level of major crops:

The production of major foodgrain crops such as bajra, jowar, maize and barley has declined in Rajasthan over the period 1970-71 to 1980-81, as evident from table given below:

Table 3.3

Production of Major Crops in Rajasthan

Name of Crops	Production (in lakh tonnes) 1970-71	1980-81
Bajra	16.17	7.82
Jowar	4.10	3.01
Maize	7.30	7.01
Wheat	17.10	26.80
Barley	6.20	5.30
Rice	1.30	1.30
Gram	9.50	9.50
Cotton	2.40	4.30

But production of wheat has increased and production of gram and rice is stagnant. Bajra production has declined to less than half, i.e. from 16.17 lakh tonnes to 7.3 lakh tonnes. Maize production has also come down from 7.3 lakh

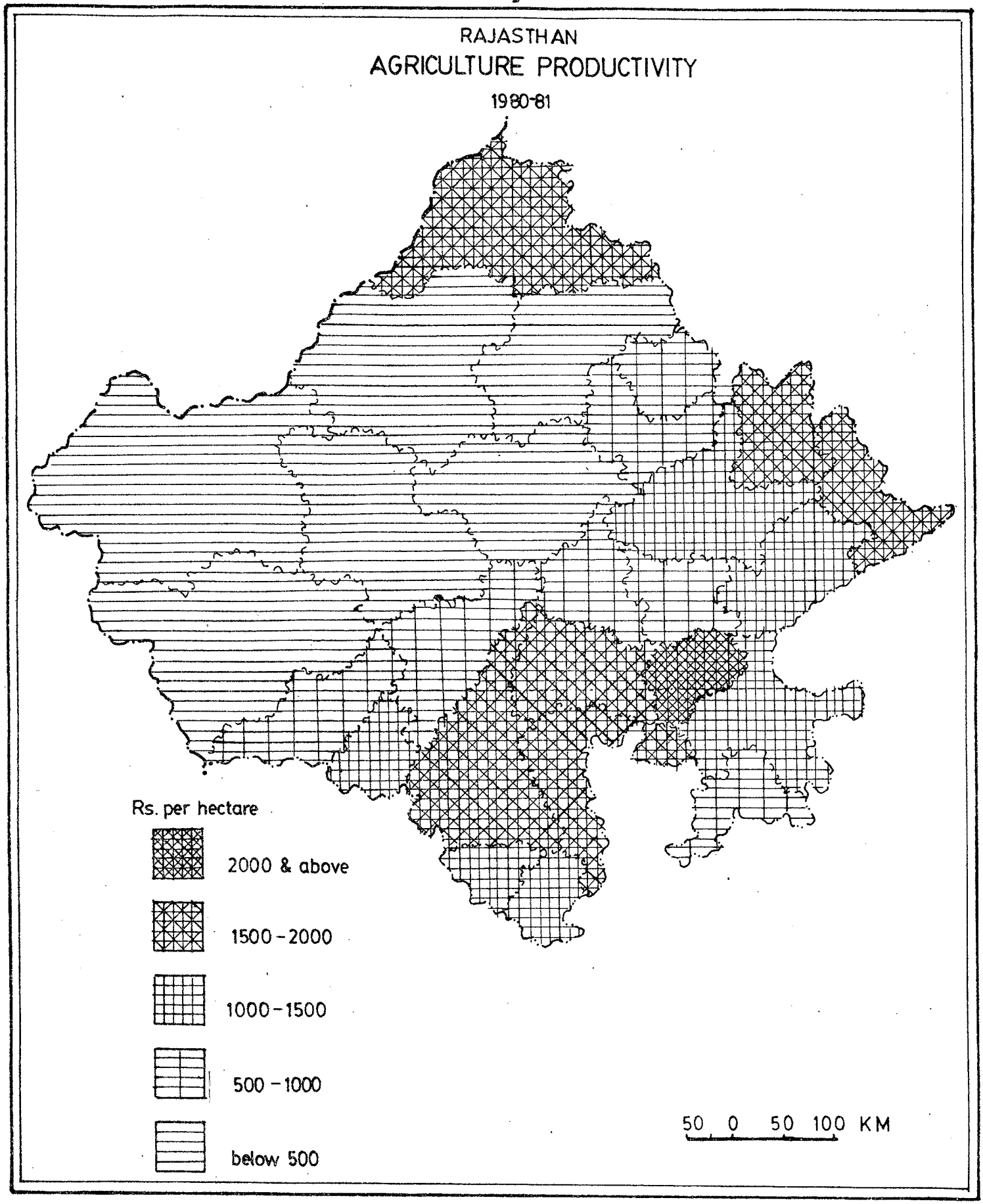
tonnes to 7.01 lakh tonnes; and for barley it has declined from 6.2 to 5.3 lakh tonnes. However, wheat production has registered a substantial growth as it has increased from 17.1 lakh tonnes to 26.8 lakh tonnes. Cotton is another crop, whose production has increased substantially, from 2.4 to 4.3 lakh tonnes. Among oilseeds only seasmum production has increased. Sugarcane production is almost stagnant (see App. X and XI).

(ii) Levels of land productivity:-

Agricultural productivity is influenced by a number of physical, socio-economic, institutional and technological factors. These factors vary over the space and hence, cause spatial variations, in levels of land productivity, as evident from fig. 3.6 and 3.7. Agricultural productivity in the state was Rs.1042.28 per ha. in 1980-81.

Agricultural land productivity is very low in 'Thar Desert' of Rajasthan. It is less than Rs.500/ha. in this area. Agricultural productivity is also low in areas which lie on the eastern fringe of the desert. While Bundi, which lies in the south-eastern part of the state, has recorded the highest agricultural productivity, i.e. Rs.2057/ ha. Other districts where land productivity is high are -

fig. 3.6


RAJASTHAN
AGRICULTURE PRODUCTIVITY
1980-81
Rs. per hectare
2000 & above
1500 - 2000
1000 - 1500
500 - 1000
below 500
50 0 50 100 KM

Ganganagar in the north, Alwar and Bharatpur in the east, and Bhilwara, Udaipur and Chittor in the south. Agricultural productivity in these districts ranges between Rs.1500 to Rs.2000 per ha. Moderately productive districts (Rs.1000 to Rs.1500/ha.) are concentrated in south-eastern and eastern parts of the state.

Soil moisture and soil seems to be determinants of spatial variability of agricultural productivity in Rajasthan. In western part of the state, soil moisture is not sufficient to meet the moisture demand of the crops in kharif season. Hence, only drought resistant crops are grown and agricultural productivity is bound to decline if soil moisture defficiency persists for a longer period of time. Soil moisture is not available to raise rabi crops and farmers have to content with sowing kharif crops only.

The level of agricultural productivity is dynamic. Modifications in physical and improvement in socio-economic conditions helps in increasing agricultural productivity. Agricultural productivity has mostly increased in the areas where agricultural productivity is already higher except Bikaner and Churu districts in north-western part of the state over the period 1970-71 to 1980-81. It is

more pronounced in Bhilwara,where it has increased from Rs.1156/ha. to Rs.1846/ha. Ganganagar, Alwar and Bundi are other districts where increase is relatively high. (see App. VI and VII). Agricultural productivity has increased only in nine districts out of 26 districts of the state. In remaining 17 districts, it has declined. Decline is alarming in the western Rajasthan particularly in the districts of Jaisalmer, Jodhpur and Barmer.

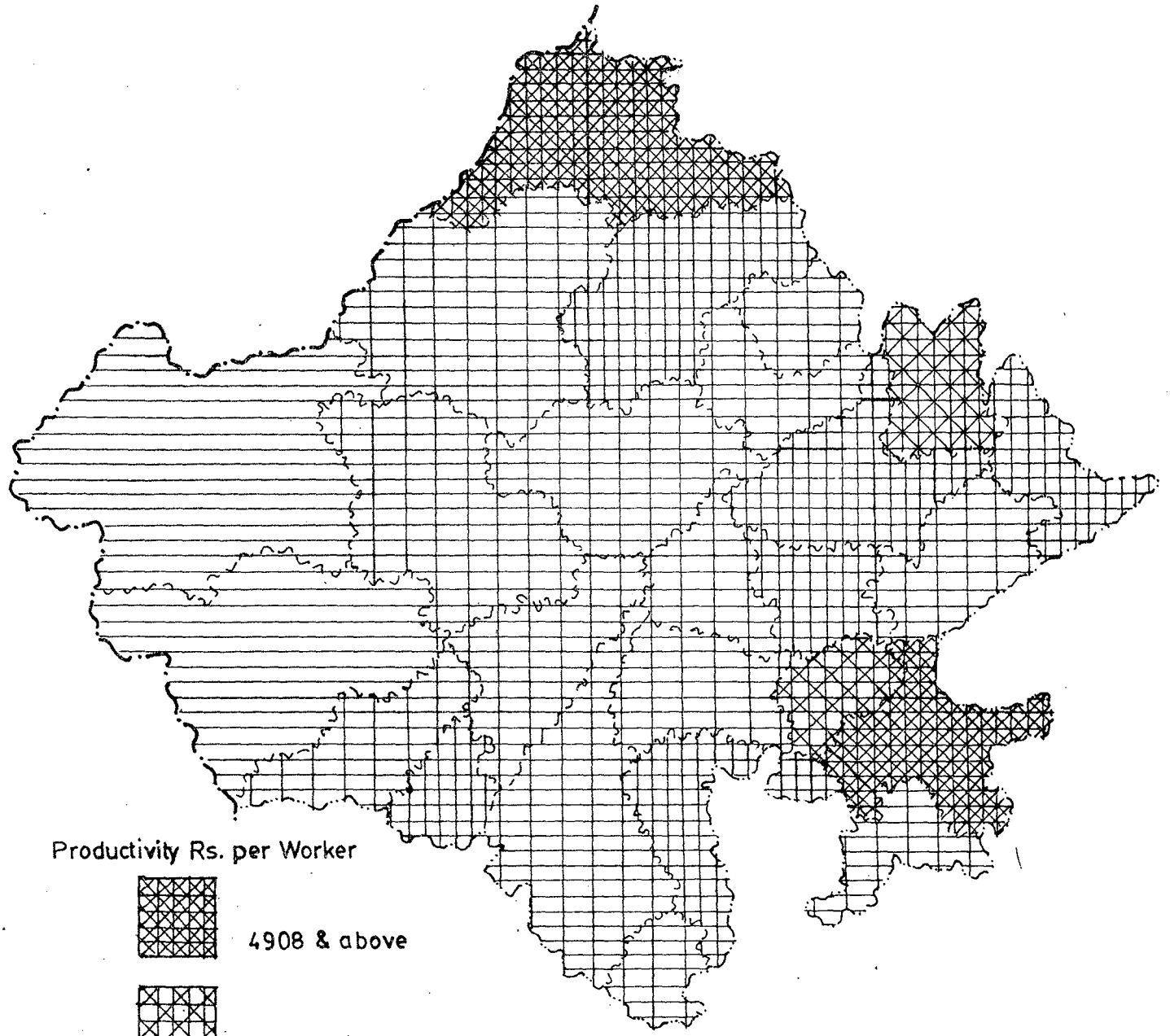
(iii) Labour Productivity:-

Agricultural labour productivity is agricultural output per worker engaged in agriculture. Average labour productivity for Rajasthan has been recorded Rs.2615 in 1980-81. Highest labour productivity in the state has been recorded in Ganganagar district, i.e. Rs.7728 and lowest being in Jaisalmer, Rs.155. As evident from fig. (3.7), there is a great deal of spatial variation in levels of labour productivity. Apart from Ganganagar, Bundi, Kota and Alwar districts also have high labour productivity, more than Rs.3652. Adjoining districts in south-eastern Rajasthan have medium labour productivity. Labour productivity is low in western and central Rajasthan. Very high labour productivity in Ganganagar district is because of

RAJASTHAN

Labour Productivity

1980-81



Productivity Rs. per Worker

- 4908 & above
- 3652-4908
- 2216-3652
- 870-2216
- below 870

50 0 50 100 KM

agricultural development with the introduction of irrigation and mechanisation.

Labour productivity has declined in Rajasthan over the decade 1970-71 to 1980-81 from Rs.2821 to Rs.2615. Out of 26 districts of the state, it has declined in 19 districts. It has increased in the district of Ganganagar, Bhilwara, Bikaner, Bundi, Chittor, Churu and Kota. Decline in labour productivity is attributed to stagnation in agricultural output and growth of agricultural workers (rural population growth 3.4 per cent/ annum during the decade).

(iv) Carrying capacity of the land:-

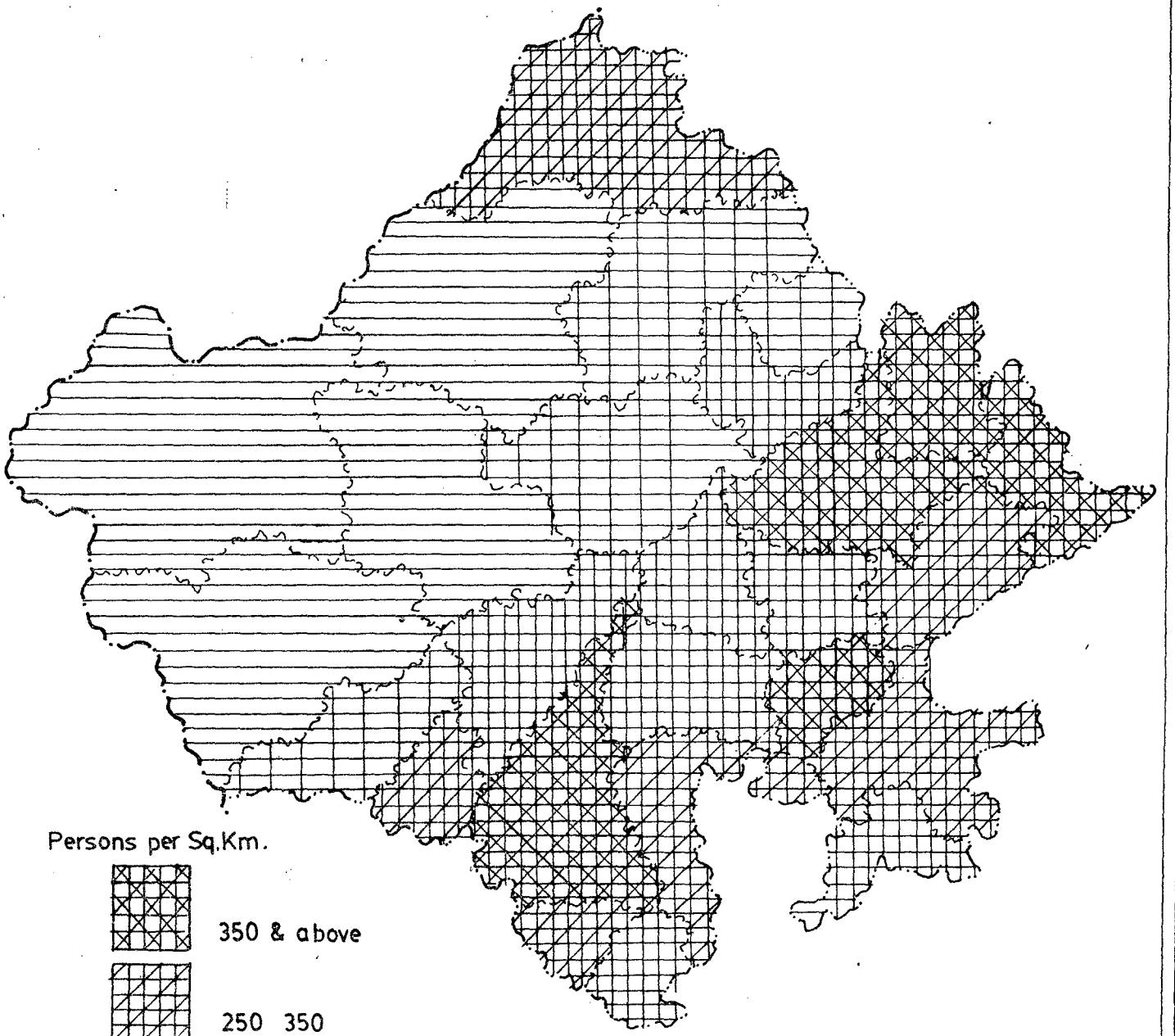
The concept of carrying capacity is derived from Botany. For agricultural geographers, carrying capacity means the number of people, the land can adequately feed. Optimum carrying capacity of the land is the function of agricultural efficiency or the level of agricultural productivity per unit area. Agricultural efficiency depends upon various agro-climatic, socio-economic and the technological and institutional factors. The cumulative effect of these factors and their variability over space results into differential levels of agricultural

fig. 3.8

RAJASTHAN

OPTIMUM CARRYING CAPACITY

1980-81



Persons per Sq.Km.

350 & above

250 350

150 250

50 150

below 50

50 0 50 100 KM

productivity and the inequalities of the carrying capacity of the land.

But the concept of optimum carrying capacity of land does not have much validity in the present phase of commercial agriculture, because it does not take into account non-foodgrain commercial crops. Non-foodgrain crops such as oilseeds, cotton and other plantation and fibre crops have played very important role in commercialisation of agriculture and agricultural development. Secondly, it is static concept and doesn't take into account progress in technology, and change in institutional structure. Still, the concept of carrying capacity is important tool in studying the subsistence agricultural economy and particularly when relationship between agriculture development and population growth is analysed.

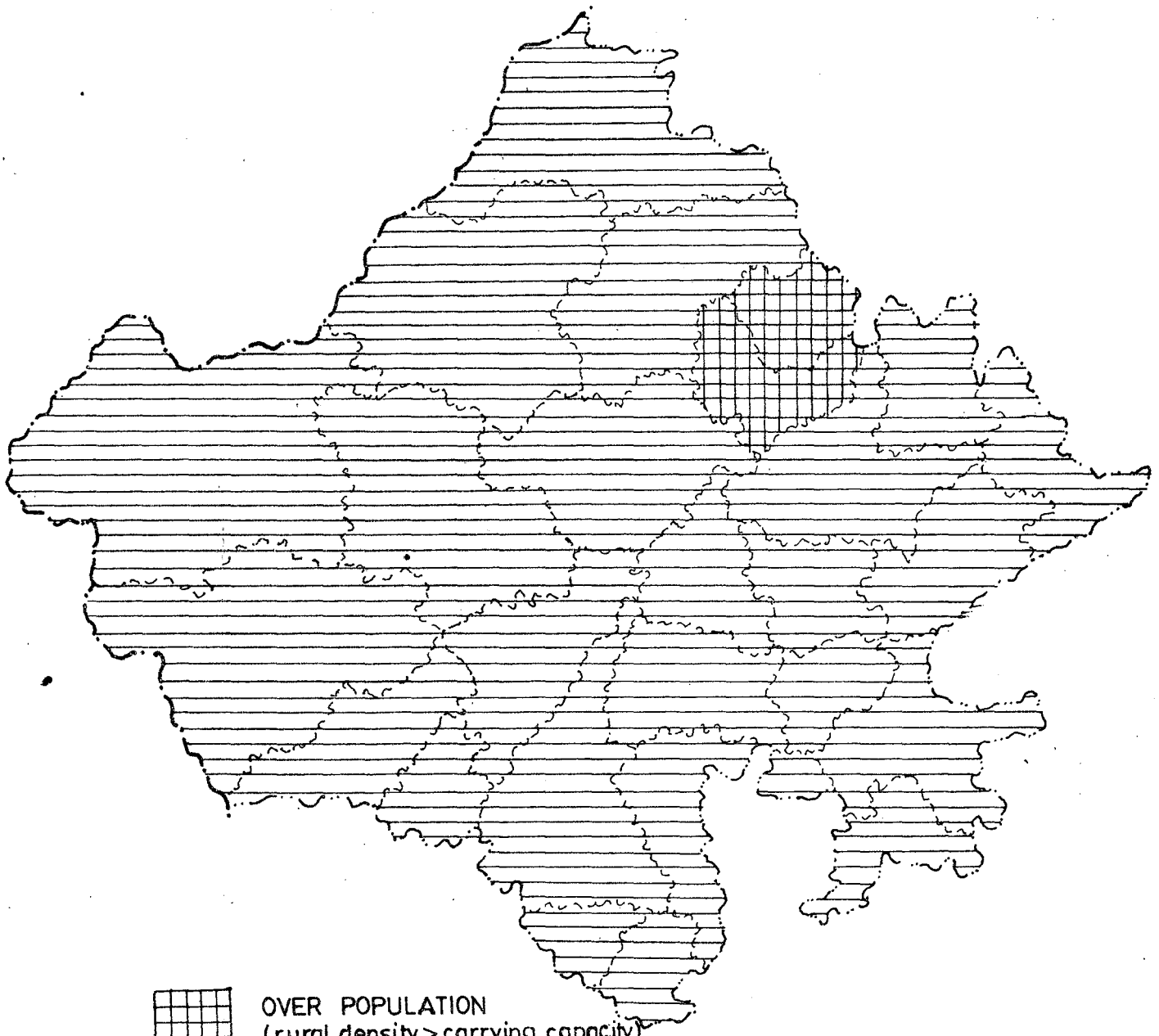
Rajasthan, has an optimum carrying capacity of 232 persons/sq.km. (1980-81). It is evident from fig.(3.8), that carrying capacity has an identical spatial pattern with that of land productivity. Carrying capacity is very low in desert area, and is low in the eastern fringe of the desert. However, Ganganagar is exception to it, and has high carrying capacity. Carrying capacity of land is

fig. 3.9

RAJASTHAN

OVER AND UNDER POPULATED AREAS

1980-81



OVER POPULATION
(rural density > carrying capacity)

UNDER POPULATION
(rural density < carrying capacity)

50 0 50 100 150 KM

high in south-eastern Rajasthan. Highest carrying capacity, 441 persons/sq.km. has been recorded in Alwar district, followed by Bundi, Udaipur, Bharatpur, and Jaipur. Carrying capacity is less than 50 persons per sq. km. in western part of the state. Agricultural carrying capacity declines as one moves from south-east to west.

Agricultural carrying capacity seems to be stagnant in Rajasthan, as it was 238persons/sq.km. (1970-71) and 232 persons/sq.km. in 1980-81. Because of fluctuations in agricultural production, it has declined in some districts of western and southern Rajasthan over the period 1970-71 to 1980-81.

As evident from fig.(3.9), carrying capacity of land exceeds the density of rural population all over the state, except Jhunjhunun and Sikar districts. The gap between carrying capacity and rural population density is very wide in eastern and southern parts and Ganganagar districts in the north. However, it is low in western Rajasthan.

D. Agricultural Technology:-

Introduction of irrigation and use of modern agricultural inputs such as high yielding varieties of

seeds, chemical fertilizers, insecticides, pesticides and machinery play very important role in raising foodgrains production and agricultural productivity as a whole. India saw 'package of new technology' introduced in mid-1960's which subsequently came to be known as 'Green Revolution'. This section of the chapter discusses levels and spatio-temporal variations in the use of new agricultural technology in Rajasthan and its impact on agricultural output.

(i) Irrigation:-

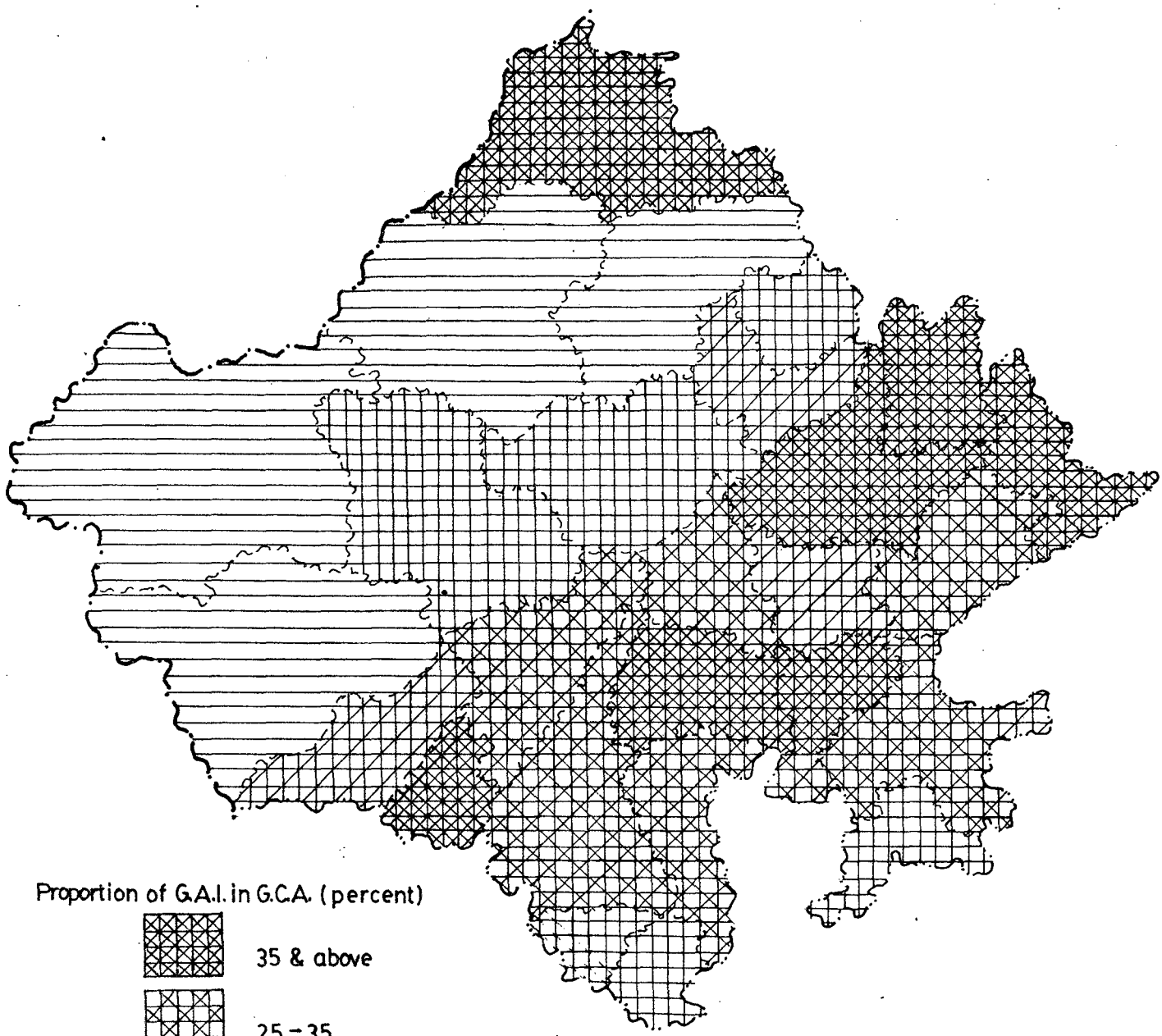
Irrigation is a spearhead of modern agricultural technology. Use of high-yielding varieties of seeds, and chemical fertilizers require assured water supply which is possible through irrigation only. Importance of irrigation is much pronounced in Rajasthan, where rainfall is most unreliable and scanty in the country. Indira Gandhi Canal and Chambal Project are two important irrigation projects to supply water for irrigation in the state; but irrigation facilities have developed at a very slow rate. Only about one-fifth of net sown area was irrigated in 1980-81 in the state.

fig. 3.10

RAJASTHAN

AREA UNDER IRRIGATION

1980-81



During the decade, 1970-71, only 14.6 per cent of netsown area in the state was irrigated. Proportion of irrigated area was highest in Ganganagar (42.1 per cent), followed by Bhilwara, Bundi, and Udaipur districts in southern Rajasthan, where it is more than 30 per cent. Irrigation is negligible in western parts of the state - Bikaner, Jaisalmer and Churu districts. Proportion of irrigated area is very low in other districts of western and south-western parts of the state. Proportion of irrigated area is relatively higher (around 25 per cent) in eastern parts of the state- Bharatpur and Jaipur districts.

After a decade, in 1980-81, 20 per cent of the net sown area was under irrigation. Bundi has the highest proportion of irrigated area (48.5 per cent), followed by Ganganagar, Jaipur, Alwar and Bhilwara, where more than two-fifth of net sown area is irrigated. In Jaisalmer and Churu districts, less than one per cent of net sown area is irrigated. Eastern and south-eastern districts in the state are moderately irrigated.

Figures of irrigation intensity are misleading in Rajasthan. The fact is that intensity of irrigation is

very low in the state. In most parts of the state, except Ganganagar and some districts in south-eastern parts of the state, kharif crops depend on rainfall for soil moisture requirement. In south and south-eastern Rajasthan, irrigation is primarily meant for rabi crops. It is evident from the fact that in 1970-71, intensity of irrigation for the state was 115 per cent. Very high irrigation intensity is recorded in Churu district, where irrigated area is negligible. Whereas south and south-western parts of the state, where proportion of irrigated area is relatively high, have recorded low irrigation intensity.

Intensity of irrigation in Rajasthan has increased to 125.6 per cent in 1980-81. High growth in intensity of irrigation has been recorded in the districts of low irrigated area. Ganganagar, Bhilwara, Bundi, Chittor and Udaipur, where proportion of irrigated area is relatively higher, irrigation intensity is moderate (see App. VI and VII).

(ii) Fertilizers Consumption:-

As discussed earlier, consumption of fertilizers is positively associated with irrigation. In case of Rajasthan also, it is evident that consumption of fertilizers is

high in irrigated areas such as Ganganagar and south-eastern districts. Per hectare consumption of fertilizers was highest in Bundi district (31 kg./ha.) in 1980-81. Ganganagar, Kota, Chittorgarh are other districts where chemical fertilizers consumption is more than 20 kg./ha. Consumption of fertilizers is moderate in other eastern and south-eastern parts of the state. Its consumption is very low in the western part of the state. It is almost negligible in Barmer, Churu, Jodhpur and Jaisalmer districts (see Appendix VII).

(iii) Agricultural Implements and Machinery:-

Mechanisation of agriculture, in India, has taken place after mid-1960's. However, agriculture has not been mechanised in Rajasthan, except the irrigated areas of south-eastern part of the state and Ganganagar district. Oil-engines and electric pumpsets which are basically utilized to pump-out ground water are more concentrated in south and south-eastern districts where land is irrigated by tubewells. In 1972, there were only 5 oil-engines/pumpsets per thousand ha. of net sown area in the state. In Jaipur district, there were 21 oil-engines and electric

pumpsets per thousand ha. of net sown area. It is followed by Chittor, Bhilwara, Bharatpur, Sirohi and Udaipur. Number of oil-engines/pumpsets doubled in five years time in 1977 in Rajasthan. However, spatial pattern of machinery remains to be almost same.

Tractors which are utilized for various agricultural operations have not been able to make sufficient dent in agricultural economy of Rajasthan. Number of tractors per thousand ha. of net sown area was relatively more (2 to 3) in irrigated areas of Ganganagar, Alwar, Bharatpur, Jaipur and Pali.

CHAPTER-IV

RELATIONSHIPS BETWEEN AGRICULTURAL AND POPULATION VARIABLES

There seems to be very intricate relationship between population growth and agricultural development in Rajasthan, because of vast differences in the agricultural economy of the plains of eastern Rajasthan and desert of Western Rajasthan. Eastern and south-eastern parts of the state has intensive subsistence agricultural economy, whereas-in western parts, agricultural resources are not fully utilized because of deficiency of soil moisture. Nomadic pastoralism, which involves less risks than crop production, is practiced in Bikaner, Barmer, and Jaisalmer districts. While introduction of irrigation and modern agricultural technology has brought about green revolution in Ganganagar district in par with Punjab and Haryana. Likewise, population density is high in eastern and south-eastern parts of the state while it is as low as 5 persons per sq. km. in Jaisalmer district. Population growth rate is very high in Ganganagar district because of heavy inmigration, where labour is required as one of the input for agricultural development. Population growth rate is also high in other districts of western Rajasthan, e.g.

Bikaner (52.88 per cent), Jaisalmer (46.47 per cent), Barmer (42.04 per cent), Jodhpur and Churu (38.87 and 35.56 per cent) respectively. This is because of improvement in health conditions and other social amenities. But still, the fact remains that population pressure in the state is high in the areas which are agriculturally developed and it is increasing at very high growth rate in the areas where agricultural growth has been induced recently, i.e. in Ganganagar district.

In this chapter, an attempt has been made to analyse the relationship between variables of population and agricultural growth with the help of statistical technique - simple correlation. Research hypothesis, proposed in the first chapter, have been tested.

Density of rural population and land-man ratio are indicators of population pressure on land resources. Density is ratio between rural population and total area, and denotes quantitative relationship between the two. Land-man ratio is further refined method of measuring population pressure on land. It takes into account cultivable land and rural population. Rural literacy rate is an indicators of qualitative development of population.

Growth of rural population is an indicator of quantitative change in rural population which is mostly dependent on agriculture. And growth of agricultural workers indicates quantitative change in population employed in agricultural sector.

Proportion of net sown area and fallow land in geographical area are indicators of agricultural landuse pattern. High proportion of net sown area and low proportion of fallow land indicates efficient agricultural landuse. Intensity of cropping indicates how intensively the net sown area is cropped. Proportion of area under major foodgrains indicates the extent to which agriculture is of subsistence nature. Land and labour productivity, and carrying capacity of land are indicators of agricultural efficiency. Proportion of gross irrigated area in gross cropped area shows the extent to which agriculture is dependent on rainfall. And number of tractors and diesel and electric pumpsets per thousand hectare of net sown area indicate level of mechanisation.

I. Population Density and Agricultural Growth:

Density of rural population is considered as the indicator of population pressure, though it is a crude indicator - as it involve not only total rural population but also total rural area.

The hypothesis says that there is positive correlation between density of rural population and net sown area. This is based on the assumption that proportion of land put to cultivation is high in the areas where population pressure is high and vice-versa. In order to feed the increasing population, agricultural production is increased by bringing more and more land under plough.

As evident from table 4.1, correlation coefficient between two variables - density of rural population and proportion of net sown area is 0.41 for the period 1970-71, which is significant at 5 per cent level of significance. Correlation coefficient between two variables for the period 1980-81, is 0.24, however, it is insignificant. This seems to be because of decline in net sown area in most districts of eastern Rajasthan. The decline in net sown area may be attributed to low rainfall in 1980-81.

Density of rural population and intensity of cropping should have positive correlation. Higher density of population requires more food supply and increase in cropped area helps in increasing food production. Expansion of

Table 4.1

Correlation Matrix: 1970-71

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1.00													
X_2	.57**	1.00												
X_3	-.08	-.32	1.00											
X_4	-.48*	-.49**	.22	1.00										
X_5	.41*	.52**	.11	.07	1.00									
X_6	.22	.21	-.33	-.27	-.07	1.00								
X_7	.36	.34	.07	.05	.41*	.35	1.00							
X_8	.61**	.24	-.22	-.26	.10	.31	.35	1.00						
X_9	.28	-.10	-.19	-.31	-.23	.31	.01	.14	1.00					
X_{10}	.67**	.19	-.01	-.42*	-.08	.63**	.20	.59**	.46*	1.00				
X_{11}	.68**	.27	-.04	-.46*	-.01	.63**	.31	.54**	.46*	.96**	1.00			
X_{12}	.25	.31	.10	-.05	.45*	.59**	.59**	.11	.13	.39*	.52**	1.00		
X_{13}	.90**	.37	-.06	-.52**	.08	.25	.16	.52**	.40*	.80**	.80**	.15	1.00	
X_{14}	.74**	.23	-.01	-.53**	-.14	.42*	.14	.53**	.41*	.84**	.79**	.13	.86**	1.00

* = Significant at five per cent level of significance.

** = Significant at one per cent level of significance.

Table 4.2

Correlation Matrix: 1980-81

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1.00													
X_2	.56**	1.00												
X_3	.11	-.11	1.00											
X_4	-.22	-.11	.28	1.00										
X_5	.24	.47*	.44*	.44*	1.00									
X_6	.16	.39*	-.31	-.10	-.01	1.00								
X_7	.20	.43*	.01	.20	.31	.67**	1.00							
X_8	.35	.29	-.13	-.22	-.14	.58**	.34	1.00						
X_9	.37	.21	-.08	-.57**	-.19	.21	.01	.31	1.00					
X_{10}	.52**	.43*	-.14	-.34	-.05	.76**	.55**	.54**	.53**	1.00				
X_{11}	.43*	.40*	-.07	-.37	-.11	.81**	.52**	.65**	.46*	.79**	1.00			
X_{12}	.11	.40*	.04	-.07	.32	.72**	.66**	.10	.02	.53**	.66**	1.00		
X_{13}	.74**	.36	.01	-.33	-.11	.27	.09	.44*	.53**	.58**	.61**	.06	1.00	
X_{14}	.55**	.29	.03	-.45*	-.23	.53**	.14	.66**	.47*	.59**	.82**	.29	.78**	1.00

* = Significant at 5 per cent level of significance.

** = Significant at one per cent level of significance.

Index for Table 4.1 and 4.2

X_1 = Rural population density.

X_2 = Rural literacy rate.

X_3 = Proportion of agricultural workers in total rural work-force.

X_4 = Proportion of fallow land in total geographical area.

X_5 = Proportion of net sown area in total geographical area.

X_6 = Proportion of gross irrigated area in gross cropped area.

X_7 = Tractors per thousand hectare of net sown area.

X_8 = Oil-engines/electric pumps per '000 ha. of net sown area.

X_9 = Proportion of area under major foodgrains to gross cropped area.

X_{10} = Optimum carrying capacity of the land.

X_{11} = Agricultural land productivity.

X_{12} = Agricultural labour productivity.

X_{13} = Man-land ratio.

X_{14} = Cropping intensity.

net sown area is not always possible, because area is inelastic. Therefore, high population density leads to multiple cropping.

As evident from table 4.1 and 4.2, density of rural population and intensity of cropping have high positive correlation. The values of correlation coefficients are 0.74 and 0.55 for the periods 1970-71 and 1980-81 respectively, which are significant at one per cent level of significance.

Density of rural population should be positively correlated with land and labour productivity. Higher density of population requires more foodgrains production and increase in land productivity is one of the contributor to increase foodgrains production. Moreover, labour productivity is high in the areas where population pressure is relatively higher, because labour is one of the basic input to increase agricultural production.

Correlation coefficients between density of rural population and land-productivity are 0.68 and 0.44 for the periods 1971 to 1981 respectively, which are significant at one and five per cent level of significance. Density of rural population and labour productivity are positively

correlated but values of correlation coefficients are not significant for both the points of time. Hence, the hypothesis that there is a positive correlation between rural density and land productivity is valid. However, another hypothesis that population density and labour productivity are positively correlated is rejected.

Density of rural population and optimum carrying capacity of the land should have positive association. Carrying capacity of the land which is supposed to be the indicator of agricultural efficiency is determined by various physical and socio-economic conditions. Hence, areas having high carrying capacity should support large number of population and vice-versa. Values of correlation coefficients between these two variables are 0.67 and 0.52 for two periods, i.e. 1971 and 1981 respectively. These values are significant at one per cent level of significance. Hence, hypothesis that rural population density and carrying capacity are positively correlated is accepted.

Density of rural population should be positively correlated with proportion of gross irrigated area. Population pressure is higher in the areas where proportion

of irrigated area is higher, which has helped in increasing agricultural production through multiple cropping and increase in productivity. It is evident from table (4.1 and 4.2), that correlation coefficient between two variables are 0.22 and 0.16 respectively, for the periods 1970-71 and 1980-81. These values of correlation coefficients are however, insignificant. Hence, hypothesis is rejected.

There should be positive correlation between rural population density and proportion of area under major foodgrains. Most parts of the state continue to have subsistence agricultural economy. Hence, the areas where population pressure is high should have largest proportion of gross cropped area devoted to foodgrain production. The correlation coefficient values between these two variables for the periods 1970-71, and 1980-81 are 0.28 and 0.37 respectively, which are not significant. This implies that research hypothesis that density of rural population and proportion of area under foodgrains are positively correlated is not accepted.

Hypothesis says that density of rural population and proportion of area under fallow land have inverse

correlation. Higher pressure of population requires more food which is increased through horizontal extension of cropped land (net sown area) in the area like Rajasthan, where irrigation facilities are not available for a larger proportion of cropped land. Hence, proportion of land kept fallow for soil reclamation is reduced because marginal and less fertile soil is also brought under cultivation. It is evident from tables (4.1 and 4.2), that correlation coefficient values for two periods of time 1970-71 and 1980-81, are -0.48 and -0.22 respectively. The r value for the period, 1970-71 is significant at 5 per cent level of significance. Hence, research hypothesis for 1970-71 is accepted. However, low and insignificant negative value of 'r' for the period, 1980-81, seems to be because of insufficient rainfall which forced the farmers in relatively higher populated areas to keep it fallow.

II. This hypothesis is related with land-man ratio and indicators of agricultural development. Land-man ratio is an indicator of population pressure which indicates population pressure more accurately, as it takes into account only arable land.

Man-landratio is positively correlated with proportion of net sown area. As population pressure per unit of arable land increases, there should be increase in net sown area to support the population. As evident from tables (4.1 and 4.2), correlation coefficients between two variables are insignificant for both periods of time. Hence, research hypothesis is rejected. Low correlation between two variables is because of the fact that man-land ratio (number of persons per ha. of land), is high in south-eastern part of the state; but proportion of net sown area is low because a large proportion of total area is covered by Aravalli hills.

Man-land ratio should be positively correlated with intensity of cropping. As discussed earlier, intensity of cropping should increase with increase in population pressure. As Boserup argues that increasing population pressure results in intensification of cropping. It is evident from the correlation matrices (tables 4.1 and 4.2), that there is high and positive correlation between land-mand ratio and intensity of cropping in Rajasthan. Correlation coefficients between two variables, for two

points of time 1970-71 and 1980-81 are 0.86 and 0.78 respectively, which are significant at one per cent level of significance. Hence, research hypothesis is accepted.

Land and labour productivity should also be positively correlated with man-land ratio. This is similar hypothesis to that between rural population density and land and labour productivity.

It is clear from tables (4.1 and 4.2) that land productivity do increase with the increase in man-land ratio. The r values for 1970-71 and 1980-81, are 0.80 and 0.61 which are significant at one per cent level of significance. Hence, research hypothesis is accepted. But, the correlation between man-land ratio and labour productivity is insignificant.

Man-land ratio and optimum carrying capacity of land are positively correlated, i.e. pressure of population is high in the areas where carrying capacity of land is comparatively high and vice-versa. Table 4.1 and 4.2 reveals the r values between the two variables for the period of time 1970-71 and 1980-81 are 0.80 and 0.59 respectively, which are significant at one per cent level of significance. Hence, research hypothesis is accepted.

Proportion of irrigation area has positive correlation with man-land ratio. Proportion of area under irrigation is one of the indicator of agricultural development, as it helps in increasing agricultural production. Tables 4.1 and 4.2 shows that correlation coefficients between two variables are 0.25 and 0.27 for 1970-71 and 1980-81 respectively. These values of 'r' are not significant at 5 per cent level of significance. Hence, research hypothesis is invalid. Weak correlation between two variables may be because of the fact- irrigation facilities have not been provided in most parts of the state.

There should be positive correlation between man-land ratio and proportion of area under foodgrains. Tables (4.1 and 4.2) shows that correlation coefficients between these two are 0.40 (1970-71) and 0.50 (1980-81). These values are significant at one significant at 5 per cent and one per cent levels of significance respectively. Hence, research hypothesis is accepted.

There exists inverse correlation between fallow land and man-land ratio. With the increase in population pressure on arable land, less fertile land is brought

under cultivation and the duration and proportion of fallow land decreases. Relationship between man-land ratio and proportion of fallow land is evident from 4.1 and 4.2. Correlation coefficients between two variables for 1970-71 and 1980-81 are (-0.52) and (-0.33) respectively. The r value for the earlier period (-0.52) is significant at one per cent level of significance. While the r value for the later period is low, and is significant at 10 per cent level of significance. Weak correlation between two variables in 1980-81 is excepted because of scanty rainfall. This confirms Boserup's theory that increasing population on land leads to change in agricultural practices or by taking less fertile or fallow land under cultivation.

III. Research hypothesis says that rural literacy is positively correlated with land and labour productivity and mechanisation. Agricultural land and labour productivity would be high in the region having high rural literacy because with the agricultural development, standard of living increases which calls for increase in education and literacy. On the other hand, increase in literacy rate has positive influence on agricultural

development, as educated farmers are comparatively likely to adopt modern agricultural inputs quickly.

Correlation coefficients between literacy and land & labour productivity (as evident from fig. 4.1) are 0.27 and 0.31 for 1970-71, which are not significant at 5 per cent level of significance. Coefficients between rural literacy, and land and labour productivity is 0.41 and 0.40, for 1980-81, which is significant at 5 per cent level of significance. Hence, research hypothesis is accepted. Strengthening correlation between rural literacy, and land and labour productivity over a decade (1970-71 to 1980-81), shows that interdependency and association between literacy and agricultural development is increasing.

Rural literacy is positively correlated with agricultural mechanisation, (i.e. number of tractors, oil-engines, electric pumpsets per' 000 ha. of cultivated land). As explained in the earlier hypothesis, that literates or educated farmers are more likely to use modern agricultural inputs. Agriculture and irrigation machinery requires some technical education which is easily grasped by the educated farmers. Hence, there should be positive correlation between literacy rate and agricultural mechanisation, which is very important part of modern agricultural technology.

It is evident from correlation matrices in Tables 4.1 and 4.2, that correlation coefficients between rural literacy and tractors and oil-engines/electric pumpsets are 0.34 and 0.24 respectively for the period 1970-71. However, these values of correlation coefficient are not significant at 5 per cent level of significance. Correlation with tractors is significant at 10 per cent level of significance. For the period 1980-81, correlation coefficient between rural literacy and use of tractors is positive (0.43) and is significant at 5 per cent level of significance. However, r value between rural literacy and irrigation machinery (oilengines/pumpsets) is low (0.30), but is significant at 10 per cent level of significance. Low values of r between these variables may be because of the fact that irrigation facilities are not much developed and underground water-table is very low in most parts of the state.

IV. Next hypothesis is concerned with the growth of rural population and agricultural growth over the period 1970-71 to 1980-81. It says that growth of rural population is positively correlated with growth of net sown area and gross cropped area. Increase in the population pressure

on agricultural land results in both horizontal (net sown area), and vertical (area sown more than once), extension of cropped land. Growth of population requires increase in foodgrains production which is met through increasing area under cultivation. Correlation coefficients of growth of rural population with net sown area and gross cropped area, (as evident from table 4.3) are 0.72 and 0.73 respectively. Both values of correlation coefficient are significant at one per cent level of significance. Hence, research hypothesis is valid.

This hypothesis says that the growth of rural population is positively correlated with land and labour productivity. Growth of population increases demand of foodgrains and agricultural productivity contributes to increase in production. Hence, technological changes are required to increase agricultural productivity alongwith the growth of population. As agricultural land and labour productivity has increased manifold in the areas, where irrigation has been introduced accompanied with high yielding varieties of seeds and chemical fertilizers.

As evident from table 4.3, growth of rural population shows insignificant correlation with land and labour

Table 4.3

Correlation Matrix

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1.00						
X_2	.46*	1.00					
X_3	.72**	.39*	1.00				
X_4	.73**	.42*	.98**	1.00			
X_5	.07	-.06	-.44*	-.39*	1.00		
X_6	-.16	.06	-.23	-.06	-.09	1.00	
X_7	.02	-.04	-.28	-.21	+.89**	-.14	1.00

X_1 = Growth of rural population
X_2 = Growth of agricultural workers
X_3 = Growth of net sown area
X_4 = Growth of gross cropped area
X_5 = Growth of agricultural land productivity
X_6 = Change in cropping intensity
X_7 = Growth of agricultural labour productivity

* = Significant at 5 per cent level of significance.

**= Significant at 1 per cent level of significance.

productivity. The r values (0.07 and 0.02) for land and labour productivity respectively, are very low and insignificant. This is because of decline in land and labour productivity in most parts of the state - because of dependency of agriculture on rainfall and meagre growth of irrigation and associated technological inputs.

V. This research hypothesis is concerned with growth of agricultural workers and variables of agricultural growth. Growth of agricultural workers is positively correlated with net sown area and gross cropped area. As the pressure of dependents on agriculture, increase on arable land, more area is brought under cultivation and farmers try to intensify the cropping. Table (4.3) reveals that the growth of agricultural workers is positively correlated with the growth of net sown area. Correlation coefficient between two variables (0.39) is significant at 5 per cent level of significance. Growth of gross cropped area also has positive correlation with the growth of agricultural workers. The value of correlation coefficient between two variables is 0.42, which is significant at 5 per cent level of significance. Hence, research hypothesis that growth of agricultural workers is positively correlated with growth of net sown area and gross cropped area is valid.

Growth of agricultural workers is positively correlated with growth of agricultural land productivity. Growth of agricultural workers accompanied with change in agricultural technology and innovations help in increasing land productivity. Table (4.3) shows that correlation coefficients between two variables is (-0.06), which is insignificant. Hence, research hypothesis is rejected.

Growth of agricultural workers is positively correlated with labour productivity. This hypothesis is based on the assumption that growth of agricultural workers is accompanied with change in agricultural technology and institutional factors helps in increasing labour productivity. However, research hypothesis is invalid as correlation coefficient between two variables is insignificant.

It is evident from the preceeding discussion, focussed on the relationship between population and agricultural variables, that two have significant relationship. Correlation between population pressure, measured in terms of density of rural population and man-land ratio, and indicators of agricultural growth; intensity of cropping, agricultural land productivity and carrying capacity of

land; is very strong and positive. Another noteworthy aspect reflected is that value of correlation coefficients (r) is high for the earlier period 1970-71, as compared to that of 1980-81. However, this fact has not been examined in depth; but low value of r for 1980-81 seems to be because of drought conditions. Deficiency of soil-moisture and erratic behaviour of Monsoons has adverse effect on variables of agricultural growth. Proportion of area under major foodgrains also have positive but weak correlation with density of rural population and man-land ratio. Growth of rural population, over the period (1971 to 1981), has very high and positive correlation with growth of net sown area and gross cropped area. This provides a good support of Boserup's theory of 'agricultural development as a response to rising population'. However, growth of rural population does not have significant positive correlation with growth of agricultural land and labour productivity. Growth of agricultural workers also have significant but low correlation with growth of net sown area and gross cropped area. But growth of agricultural workers does not have positive correlation with agricultural land and labour productivity. Insignificant correlation between growth of population and

agricultural workers and land and labour productivity is because of the fact that agriculture in the state continues to be dependent on rainfall for soil-moisture supply. Growth of irrigation facilities is meagre and modern agricultural technology is not very popular except some districts of eastern Rajasthan and Ganganagar district in the north. Both land and labour productivity have increased tremendously in Ganganagar, where irrigation development is accompanied with modern agricultural technology. Literacy rate has significant positive correlation with land and labour productivity, and number of tractors per thousand ha. of net cultivated land for the period, 1980-81. However, relationship between these variables is insignificant for the earlier period.

CHAPTER-V

SUMMARY OF CONCLUSIONS

Relationship between economic development and population growth has been an important theme of discussion since ages. However, emphasis on this point has been particularly laid since 18th century which corresponded with overthrowing of feudalism and onset of new mode of production, capitalism, in Europe. Robert Wallace, Joseph Townsend, Benjamin Franklin, James Staurt and William Godwin were some of the thinkers of 18th century who concentrated their views on population growth viz-a-viz economic development. But much talked about theory of population has been of Robert Malthus who published 'An Essay on the Principle of Population' in 1798. Malthus, theorised that growth of population is geometrical while increase in food production is arithmatical which results into increase in population to the level where standard of living falls and hence, subject to subsistence standard of living and poverty. But this theory of population was severely criticised by Marx and several other progressive scholars for its assumption of geometrical growth of population and arithmatical growth of food production, static nature of social organisations and lack of perception of technological advancement which was on the cards in form of industrial revolution. Followers of Malthus tried to justify this theory

with the help of the concept-diminishing return to scale. Later on Neo-Malthusians defended Malthus theory by developing the concept of optimum limit.

Growth of population viz-a-viz economic development has been a focal point of discussion in developing countries and particularly India - where Neo-Malthusians still stress that overpopulation is a major cause of its underdevelopment. Rajasthan is one of the state in the country which lags behind even national average in terms of economic development. It is the second largest state of the country (covers 11.2 per cent of area) and accomodates 5.1 8 per cent of the population of the country. According to 1981 census, about 79 per cent of population in the state live in rural areas. Agriculture is a dominant sector of economy - as about 82.0 per cent of working population is engaged in agricultural activities. Growth of agricultural production in the state is very low and agricultural land and labour productivity is even below national average. Density of population is low (100 persons per sq. km.) as compared to national average (221 persons/ sq. km.). However, growth rate of population in the state is highest for the decade 1971-81 (32.38 per cent) among the states of India except Nagaland and Sikkim.

Hence, the present study proposes to analyse spatial-temporal variations in population growth, its socio-economic

characteristics, and levels of agricultural development and relationship between population growth and agricultural development in Rajasthan which has relatively sparse population - prominently deriving its living from subsistence agricultural economy. Rural population and socio-economic characteristics of rural population have been taken into account to correlate with variables of agricultural development as rural population mainly derives its earning from agriculture directly.

Population distribution in the state is uneven in the space. Density of rural population is 80 persons per sq. km. Density of rural population is highest in Bharatpur district (196 persons), followed by Alwar (191 persons). Banswara and Dungarpur in south, and Jaipur, Sikar and Jhunjhunun in the east are other districts where density of rural population is above 150 persons per sq. km. Density of rural population in the state declines gradually as one moves from east, relatively fertile plain, to west, a desert area, where land is relatively less fertile and climatic conditions are harsh and arid. Density of rural population in Jaisalmer district is very low-5 persons per sq. km. Other districts of the desert- Barmer, Bikaner and Jodhpur - have density of rural population below 50 persons per sq. km.

Rural population in the state has increased at the rate of 27.47 per cent during the decade 1971 to 1981. Highest growth rate in the state has been recorded in Bikaner district (52.88 per cent), followed by Jaisalmer (46.47 per cent) and Barmer (42.04 per cent). Ganganagar, Jodhpur and Churu are other districts in western Rajasthan, where decadal growth rate of rural population is above 35 per cent. Growth rate of rural population declines moving west to east. Ajmer district has recorded lowest decadal growth rate in the state (15.14 per cent). High growth rate of rural population in the western and north western part of the state can be attributed to relatively smaller size of population, improvement in health facilities, and agricultural and infrastructural development.

Literacy rate in Rajasthan is lowest among the states of India. According to 1981 census, literacy rate of the state was 24 per cent. Rural literacy rate in the state is even low, 18 per cent. Barmer district has lowest literacy rate in the state (9.01 per cent). Banswara, Bikaner, Churu, Jaisalmer, Jalor, Jodhpur and Sirohi are other districts where rural literacy rate is below 15 per cent. Jhunjhunun district has highest literacy rate (25.76 per cent) in the state followed by Alwar, Kota, Sikar and Bharatpur districts.

In the rural areas of the state, according to 1981 census, 36.55 per cent of the population was enumerated as workers. Chittorgarh district has recorded highest proportion of working population in rural population (47.92 per cent). Banswara, Barmer and Dungarpur are other districts where more than two fifth of rural population is working. Lowest proportion of working population has been recorded in Sikar district (30.67 per cent). 81.48 per cent of working population in the state is engaged in agriculture. Churu district has highest proportion of agricultural workers in working population, 91.47 per cent, followed by Ganganagar, Jodhpur, Barmer and Banswara districts (above 85.00 per cent). Proportion of agricultural workers in working population is less than 70 per cent in Sirohi and Jaisalmer districts. Cultivators constitute 73.13 per cent of working population in Rajasthan. Highest proportion of cultivators in working population is in Churu district (88.86 per cent). Proportion of cultivators in working population is also above 80 per cent in Banswara, Barmer and Jodhpur districts. While Sirohi has about half of its working population as cultivators. Less than 60 per cent of working population is engaged as cultivators in Kota and Pali districts. Agricultural labourers constitute 8.38 per cent of working population in

Rajasthan. Kota has highest proportion of agriculture labourers (19.8 per cent), followed by Sirohi, Pali, Ganganagar and Jhalawar (above 15 per cent). Churu district has lowest proportion of agriculture labourers in working population (2.61 per cent). Barmer, Bikaner, Jaisalmer, Sikar and Jhunjhunun are other districts where proportion of agriculture labourers is less than 5 per cent. Proportion of cultivators in working population is high in the districts where proportion of agriculture labourers is low and vice-versa.

Various variables have been taken into account to assess level of agricultural development; and landuse pattern is one of them. Proportion of net sown area in total area is constant in Rajasthan i.e., 42.47 per cent in 1970-71 and 43.86 per cent in 1980-81. Area under forest is also very low, 6.07 per cent in 1980-81. However, it was even low in 1970-71, 3.99 per cent. Proportion of forest area is high in southern part of the state - Banswara, Bundi, Dungarpur, Jalawar, Kota, S. Madhopur, Sirohi and Udaipur, above 15 per cent. Area under forest is negligible in desert of western Rajasthan, less than 2 per cent - in Barmer, Churu, Ganganagar, Jalor, Jodhpur, Nagaur and Pali districts. Proportion of culturable wasteland has also been stagnant over the decade, 18-19 per cent (1970-71) and 18.52 per cent in

1980-81. Its proportion is highest in Jaisalmer (77.01 per cent), followed by Bikaner (50.00 per cent). Other, districts of western and southern Rajasthan also have high proportion of culturable wasteland. About 13.10 per cent of area in the state is fallow land. Highest proportion of fallow land in the state is in Jodhpur (30.04 per cent). Churu, Jalor, Nagaur and Pali are other districts where proportion of fallow land cover more than one-fifth of the area. Fallow land decreases as one moves from west to east. Jhunjhunun has highest proportion of net sown area (72.31 per cent). Churu, Alwar, Ganganagar, Nagaur, Sikar and Tonk districts have more than 60 per cent area under cultivation. On the other hand, Jaisalmer has lowest proportion of area under cultivation (6.81 per cent). Less than one-third of area is under cultivation in Bhilwara, Bikaner, Chittorgarh, Dungarpur, Sirohi and Udaipur districts. Low proportion of area under cultivation in south Rajasthan is because Aravalli ranges run through this area and proportion of barren land is high. While low proportion of net sown area in western most Rajasthan is because of extreme aridity and low fertility of land. Hence, proportion of culturable wasteland (sand dunes) and fallow land is very high. People prefer raising live-stock than risky agriculture. However, the process of

adopting sedentary agriculture has set on because of increasing population pressure.

Cropping intensity is low in Rajasthan, as it was 116 per cent in 1980-81. Udaipur has highest cropping intensity (147 per cent) followed by Chittorgarh, Dungarpur, and Bhilwara. Cropping intensity is also comparatively higher in Ganganagar and south-eastern Rajasthan. Jaisalmer has almost negligible area sown more than once. Cropping intensity is also comparatively very low in other districts of western Rajasthan.

Cultivable land per head was 0.95 hectare in Rajasthan in 1981. Man-land ratio is highest in Jaisalmer (15.74 ha.) followed by other districts of wester Rajasthan-Bikaner, Barmer, Churu, Jodhpur, Ganganagar, Nagaur and Jalor. Dungarpur district has lowest man-land ratio (0.33 ha.) in the state. Man-land ratio is also low in other districts of southern Rajasthan.

Bajra is dominant crop in Rajasthan as it covered 27.22 per cent of gross cropped area in 1980-81. However, its share in GCA which was 30.57 per cent in 1970-71 has declined over the decade. Bajra is monoculture in western most part of the state, Jaisalmer, where it covered 69.01 per cent of GCA. It is a dominant crop in 14 districts of

the state. It is sown in combination with kharif pulses and gawar in western Rajasthan and wheat, gram and oilseeds in eastern Rajasthan. Gram is dominant crop in Ganganagar where it is sown in combination with wheat, gram, rice, barley and cotton. Jowar is dominant crop in four districts in south eastern Rajasthan and is sown in combination with wheat, gram and maize. Wheat is a dominant crop in Sirohi and Bundi districts. Cropping pattern is diversified in south and eastern Rajasthan where more than four crop combination exists. On the other hand, in western most Rajasthan bajra is monoculture.

Production of major foodgrains has declined in Rajasthan over the decade 1970-71 to 1980-81. Production of bajra was 7.82 lakh tonnes which was less than half of its production in 1970-71 (16.17 lakh tonnes). This is because of scanty rainfall and decline in area under this crop. Production of jowar, maize and barley also saw decline, however, it is not as sharp as it is of bajra. Among major foodgrains, wheat has registered increase in production over the decade from 17.10 lakh tonnes to 26.80 lakh tonnes. Production of rice and gram is stagnant. Among non-foodgrain crops- cotton production has increased from 2.40 lakh tonnes to 4.30 lakh tonnes.

Agricultural land productivity in Rajasthan was Rs.1042 per ha. in 1980-81. In fact, Rajasthan is one of the backward state of India in terms of agricultural development. Land productivity has declined over the study period as it was Rs. 1168 per ha. in 1970-71. This is because of fluctuations in rainfall which does not supply sufficient soil moisture to raise crops successfully. Level of land productivity is highest in Bundi district (Rs.2057 per ha.), followed by Alwar, Bhilwara, Bharatpur, Chittor, Ganganagar and Udaipur districts. Level of land productivity is lowest in Jaisalmer district (Rs.28 per ha.) followed by Barmer and Bikaner where it is less than Rs.200 per ha. Land productivity in Rajasthan declines moving east to west except Ganganagar district where introduction of irrigation has raised agricultural productivity in par with agriculturally developed areas in east and southeast parts of the state.

Like land productivity, agriculture labour productivity has also declined in Rajasthan over the period 1970-71 to 1980-81 from Rs.2821 to Rs.2615 per agricultural worker. Ganganagar has recorded highest labour productivity in the state in 1980-81 (Rs.7228), followed by Bundi (Rs.4398), Kota (Rs.3751) and Alwar (Rs.3652). Labour productivity is lowest in Jaisalmer (Rs.155) followed by Barmer (Rs.885).

Bikaner, Jodhpur and Nagaur in the west, and Ajmer and Banswara districts also have comparatively low labour productivity, (less than Rs.1500).

Carrying capacity of land seems to be stagnant in the state as it was 238 and 232 persons per sq. km. in 1970-71 and 1980-81 respectively. Carrying capacity of land is comparatively higher in eastern and southern parts and Ganganagar in north. It is highest in Alwar district (441 persons per sq. km.), followed by Bundi and Udaipur (above 400 persons per sq. km.). Jaisalmer has lowest carrying capacity, (8 persons per sq. km.). Other districts in western Rajasthan - Barmer, Bikaner and Jodhpur also have carrying capacity less than 50 persons per sq. km. It increases moving west to east in the state. Comparison between carrying capacity and rural population density shows that except Jhunjhunun and Sikar districts, all the other districts have lower population than their carrying capacity. Difference between two is comparatively higher in south-eastern part and Ganganagar district.

Not much stride has been made in the state in terms of irrigation development. Only about one-fifth of gross cropped area in the state was irrigated in 1980-81. However, it is more than the proportion of irrigated area in 1970-71,

15.30 per cent. About 53 per cent of gross cropped area in Ganganagar is irrigated as it is irrigated by Indira Gandhi canal (stage I), Ganga canal and Bhakra canal. In south east, Bhilwara, Bundi and Jaipur districts, more than 40 per cent of area is irrigated. Area under irrigation is negligible in Jaisalmer and Churu districts. Proportion of irrigation is very low in other districts of west Rajasthan.

Fertilizers consumption in Rajasthan is very low, i.e. 8 km. per ha. in 1980-81. In fact, use of chemical fertilizers is not very popular to the farmers in desert areas. Its consumption is comparatively more in the irrigated areas of Ganganagar and south-eastern districts. Per hectare consumption of fertilizers is 25 kg. in Ganganagar. Number of oil-engines and electric pumpsets per thousand hac. is very low in Rajasthan, i.e. (11.21 in 1977). It is higher, more than 30 in eastern districts - Alwar, Bharatpur, Chittor and Jaipur. Similarly, number of tractors per thousand ha. of net sown area was very low in the state (1.64) in 1977. Number of tractors per thousand ha. of net sown area is comparatively higher in Alwar, Bharatpur and Ganganagar districts. In fact, low consumption of chemical fertilizers, number of tractors, oilengines and pumpsets is because of low proportion of cultivated area under irrigation which is considered to be spearhead of green revolution in India.

This explains subsistence nature of agriculture economy of the state which depends mainly on rainfall and uses traditional agriculture technology and agricultural practices.

Density of rural population, an indicator of population pressure on land, has significant relationship with indicators of landuse. Density of rural population had positive correlation coefficient (0.41) with proportion of net sown area in 1970-71 which is significant at 5 per cent level of significance. However, correlation between two variables is not significant for second period, 1980-81, because of intervention of climatic factors - occurrence of comparatively low rainfall, which inevitably caused decline in proportion of net sown area in raifed districts of eastern Rajasthan. Density of rural population had strong positive correlation with cropping intensity (0.74 and .55) for 1970-71 and 1980-81 respectively, which is significant at one per cent level of significance. Population density has negative correlation with fallow land (-0.48 and -0.22 in 1970-71 and 1980-81 respectively). Correlation between two variables, however, is not significant for the period 1980-81. Man-land ratio which is even refined indicator of population pressure also has negative correlation with fallow land (-0.52 for 1970-71), however, it is not significant for the later period 1980-81.

Man-land ratio has strong positive correlation with cropping intensity (0.86 and 0.78 for two periods respectively). Hence, pressure of population has strong positive correlation with indicators of landuse intensity i.e., land is utulized intensively to raise crops in the areas where population pressure is comparatively higher and vice-versa. Population pressure has strong positive correlation with land productivity and carrying capacity of land. Correlation coefficient between density of rural population and land productivity is 0.68 and 0.43 for two periods -1970-71 and 1980-81. Similarly, correlation between man-land ratio and land productivity is 0.80 and 0.61 for two periods which is significant at one per cent level of significance. Density of rural population also has strong positive correlation with carrying capacity of land (0.67 and 0.52 for two time periods respectively). Man-land ratio also has significant positive correlation with proportion of area under major foodgrains.

Growth of rural population has strong positive correlation with growth of net sown area and gross cropped area. This implies that increase in population pressure leads to intensification of land utilization for agriculture. Correlation coefficient between population growth and growth

of net down area and gross cropped area is 0.72 and 0.73 which is significant at one per cent level of significance.

Growth of working population engaged in agriculture also has positive correlation with growth of net sown area and gross cropped area. Correlation coefficients between growth of agriculture workers and growth of net sown area and gross cropped area are 0.39 and 0.42 respectively which are significant at 5 per cent level of significance.

Correlation analysis shows that growth of population and agricultural development go hand in hand in subsistence economy of Rajasthan. It is evident from discussion that areas where population pressure/land is high, land is /on intensively utilized to raise crops and also agricultural land productivity is comparatively high. Growth of population in the state over the decade 1971 to 1981 has led to further intensification of land utilization for agricultural purposes. Insignificant correlation between change in land and labour productivity and population growth suggests that agricultural production in the state is subject to vagaries of Monsoon. Despite the intensification of agricultural landuse, land and labour productivity have

declined. The other questions unanswered by this study are relationship between literacy rate and agricultural growth, population pressure and irrigation and mechanisation of agriculture. And there are other questions which are not raised in this study pertaining to population pressure and growth and socio-economic conditions of agricultural communities. A further investigation of these questions is perhaps required through micro-level study.

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RAJASTHAN

POPULATION VARIABLES

(1971)

APPENDIX I

S.No.	Districts	Rural Density	% of Rural Literacy	Rural Dependency Ratio	% of rural workers to total rural Population	% of cultivators	% of agricultural labourers
1.	Ajmer	85.43	16.01	93.66	39.87	69.27	10.96
2.	Alwar	152.06	16.94	110.02	28.31	73.68	9.01
3.	Banswara	123.92	10.28	110.56	28.20	85.24	7.64
4.	Barmer	25.34	8.38	95.59	34.62	85.05	6.93
5.	Bharatpur	161.79	15.93	102.31	29.37	79.64	9.67
6.	Bhilwara	91.47	11.83	110.61	40.33	75.74	6.89
7.	Bikaner	12.41	11.71	108.02	32.46	80.05	8.59
8.	Bundi	70.02	11.66	93.41	34.48	65.13	12.79
9.	Chittorgarh	78.90	14.36	85.47	39.90	78.69	7.96
10.	Churu	37.08	12.08	113.78	33.42	89.74	3.94
11.	Dungarpur	133.08	12.05	106.60	28.23	79.04	11.99
12.	Ganganagar	56.67	15.40	115.94	29.14	69.96	19.78
13.	Jaipur	127.55	14.11	101.88	31.98	72.10	7.62
14.	Jaisalmer	3.74	8.73	90.65	31.98	70.72	9.08
15.	Jalor	60.06	8.95	102.29	31.74	68.83	15.05
16.	Jhalawar	91.67	14.55	96.86	32.57	67.99	17.80
17.	Jhunjhunun	131.16	20.80	110.44	26.05	72.27	6.81
18.	Jodhpur	35.01	10.63	108.23	32.77	81.68	8.48
19.	Kota	71.03	18.30	110.07	31.41	59.91	19.36
20.	Nagaur	63.34	12.44	103.60	35.26	80.91	7.81
21.	Pali	70.63	14.62	102.23	32.80	53.70	21.37
22.	S.Madhopur	100.17	13.68	102.51	33.03	75.96	9.08
23.	Sikar	112.76	16.92	107.16	28.02	75.67	5.50
24.	Sirohi	68.56	10.74	101.70	30.76	49.40	23.32
25.	Tonk	73.55	11.70	92.78	35.28	76.75	8.34
26.	Udaipur	92.34	12.69	93.29	32.65	77.12	6.88
	Rajasthan	62.70	13.85	100.45	32.39	74.24	10.35

RAJASTHAN

POPULATION VARIABLES

(1981)

App. II

S.No.	Districts	Rural Density	% of Rural Literates	Rural Dependency Ratio	% of Rural workers to total rural population	% of cultivators	Proportion of agriculture labourers
1.	Ajmer	102.49	19.17	88.08	38.67	66.72	9.91
2.	Alwar	191.00	22.86	104.54	35.83	74.03	5.77
3.	Banswara	161.18	14.03	109.92	42.17	80.61	6.83
4.	Barmer	36.04	9.01	97.68	41.77	83.73	2.82
5.	Bharatpur	196.12	22.23	102.56	32.42	78.20	6.60
6.	Bhilwara	109.83	15.53	82.37	44.72	74.02	6.14
7.	Bikaner	19.00	13.51	103.24	32.89	77.80	2.80
8.	Bundi	90.07	15.00	83.46	37.62	66.63	10.80
9.	Chittorgarh	100.00	17.37	87.89	47.92	76.25	7.40
10.	Churu	50.31	14.62	106.72	35.40	88.86	2.61
11.	Dungarpur	170.19	15.88	98.12	44.42	75.49	8.49
12.	Ganganagar	78.51	20.48	100.36	32.77	69.14	17.11
13.	Jaipur	159.64	20.03	96.95	32.76	70.87	5.37
14.	Jaisalmer	5	10.54	87.66	35.46	65.82	3.51
15.	Jalor	78	11.47	104.45	34.61	73.15	11.81
16.	Jhalawar	112.00	18.10	98.06	39.71	70.2	15.66
17.	Jhunjhunun	166.19	25.76	106.17	33.84	71.84	4.96
18.	Jodhpur	48.00	14.23	96.90	33.83	81.28	6.20
19.	Kota	87.58	22.80	94.53	33.80	56.23	19.80
20.	Nagaur	79.75	16.58	98.62	37.83	78.84	5.94
21.	Pali	85.75	17.95	99.47	37.28	58.27	17.47
22.	S.Madhopur	127.81	19.99	94.31	33.98	77.19	5.63
23.	Sikar	183.00	22.42	99.16	30.67	72.79	4.95
24.	Sirohi	87.43	13.46	102.89	35.02	50.14	18.63
25.	Tonk	91.00	16.51	98.40	30.69	70.98	8.33
26.	Udaipur	117.15	15.78	94.24	39.78	74.33	6.26
	Rajasthan	80.09	17.99	99.91	36.55	73.13	8.35

RAJASTHAN

GROWTH AND CHANGE OF POPULATION VARIABLES

1971 to 1981

App III

Districts	Growth of Population	Absolute Change in Density	% change in literacy	Changes in Rural Dependency Ratio	Growth Rate of Total Work Force.
1. Ajmer	15.14	17	3.16	- 5.58	34.40
2. Alwar	23.34	39	5.92	- 5.48	64.25
3. Banswara	33.80	43	3.75	- 0.62	104.26
4. Barmer	42.04	11	1.62	+ 2.09	74.99
5. Bharatpur	21.58	34	6.30	+ 0.25	40.19
6. Bhilwara	19.52	19	3.70	- 28.24	40.41
7. Bikaner	52.88	7	1.80	- 4.78	77.78
8. Bundi	27.04	20	3.34	- 9.95	47.21
9. Chittorgarh	26.30	21	3.01	2.42	60.36
10. Churu	35.56	13	2.54	- 7.06	58.64
11. Dungarpur	28.00	37	3.83	- 8.48	107.44
12. Ganganagar	36.43	21	5.08	- 15.58	62.23
13. Jaipur	25.88	33	5.92	- 4.93	39.97
14. Jaisalmer	46.47	1	1.81	- 2.99	71.21
15. Jalor	30.05	18	2.52	2.16	40.50
16. Jhalawar	22.75	20	3.55	1.20	56.13
17. Jhunjhunon	27.17	35	4.96	- 4.27	78.07
18. Jodhpur	38.87	13	3.60	- 11.33	59.41
19. Kota	22.45	16	4.50	- 15.54	42.23
20. Nagaur	25.69	17	4.14	- 4.98	41.67
21. Pali	20.68	15	3.33	- 2.76	43.78
22. S.Madhopur	26.47	28	6.31	- 8.20	35.70
23. Sikar	26.96	70	5.50	- 8.00	48.30
24. Sirohi	27.85	18	2.72	- 1.19	52.19
25. Tonk	23.84	18	4.81	- 6.38	52.65
26. Udaipur	26.57	25	3.09	+ 0.95	60.93
Rajasthan	27.47	17	4.14	- 0.54	53.74

RAJASTHAN

LAND UTILISATION 1970-71.

PROPORTION IN TOTAL REPORTING AREA

Appendix IV

S.No.	District.	Forests	Area Under non-agri-cultural uses.	Barren & uncultivated land.	Permanent Pastures	Land Under miscellaneous tree Crops.	Culturable Waste Land.	Fallow land other than current fallow	Current fallow	Net Sown area
1.	Ajmer	4.20	4.49	12.79	8.88	-	13.02	4.46	4.81	47.30
2.	Alwar	2.31	4.76	17.89	4.95	-	3.57	.67	1.22	64.52
3.	Banswara	15.33	1.23	18.40	7.18	-	3.68	9.10	4.30	39.97
4.	Barmer	.01	1.86	5.52	7.27	-	15.31	20.83	11.46	37.18
5.	Bharatpur	3.70	5.20	14.43	4.53	-	3.03	1.30	2.06	65.59
6.	Bhilwara	1.89	4.04	16.15	10.74	-	27.20	6.09	3.39	30.15
7.	Bikaner	.01	4.10	-	-	-	63.45	5.76	4.05	21.22
8.	Bundi	5.39	4.63	32.91	4.73	-	5.39	2.76	3.80	40.14
9.	Chittorgarh	6.38	3.45	16.09	8.16	-	27.73	1.72	1.39	33.04
10.	Churu	.00	4.64	-	2.66	-	4.73	8.60	7.58	71.32
11.	Dungarpur	17.86	3.93	20.48	11.58	-	8.46	2.96	2.47	31.94
12.	Ganganagar	.00	4.64	-	-	-	20.73	5.42	7.77	60.98
13.	Jaipur	3.55	4.52	8.16	7.68	-	7.04	3.99	6.52	58.40
14.	Jaisalmer	.00	1.22	42.10	1.97	-	47.55	2.96	.69	2.97
15.	Jalor	.00	3.13	8.89	4.87	-	1.31	11.40	11.57	58.10
16.	Jhalawar	6.87	4.08	14.45	8.91	-	15.30	1.35	1.18	47.72
17.	Jhunjhunun	5.91	2.17	3.34	7.79	-	1.04	1.17	2.10	76.41
18.	Jodhpur	.00	4.23	6.41	4.85	-	2.43	20.39	11.27	50.21
19.	Kota	18.87	3.54	11.64	4.59	-	11.83	1.49	1.37	46.55
20.	Nagaur	.00	4.09	4.53	4.54	-	-	5.40	12.53	68.43
21.	Pali	5.23	3.62	12.49	7.32	-	1.02	14.43	11.05	44.79
22.	S. Madhopur	17.13	2.85	16.13	7.98	-	5.73	1.04	1.71	47.34
23.	Sikar	1.34	2.94	7.68	6.28	-	2.25	2.64	5.89	70.93
24.	Sirohi	9.29	3.69	32.83	6.74	-	4.07	8.02	4.80	30.76
25.	Tonk	2.50	4.15	5.56	9.40	-	10.52	1.73	2.69	63.18
26.	Udaipur	15.25	6.15	30.95	9.81	-	13.99	2.68	1.68	19.41
	RAJASTHAN	3.99	3.59	13.78	5.31	-	18.14	7.04	5.62	42.47

RAJASTHAN

LAND UTILIZATION - 1980-81

PROPORTION IN TOTAL REPORTING AREA

Appendix V

	Distts.	Forests	Land put to Non-Agricultural Uses	Barren & Uncultivated Land.	Permanent Pastures & other Grazing Land.	Land under Miscellenous Tree Crops.	Cultirable waste Land	Other than Current Fallow	Current Fallow	Net Area Sown
1.	Ajmer	4.16	4.94	13.00	9.29	.03	12.86	6.69	6.11	42.89
2.	Alwar	2.09	5.53	16.48	3.23	.13	2.17	2.45	5.74	62.15
3.	Banswara	19.91	1.55	16.44	6.69	.01	3.70	4.63	4.21	41.92
4.	Barmer	.54	2.13	4.86	7.64	.00	12.23	1.11	8.55	52.21
5.	Bharatpur	4.49	5.42	13.24	3.79	.13	2.57	3.74	9.60	56.98
6.	Bhilwara	5.02	5.21	17.88	11.50	.01	22.51	5.57	4.07	28.18
7.	Bikaner	1.04	4.65	.33	1.44	-	50.09	6.21	4.91	30.85
8.	Bundi	22.40	6.12	17.87	4.12	.05	5.87	3.60	4.27	39.89
9.	Chittargarh	13.33	6.11	13.86	7.85	.06	21.57	2.33	1.95	32.89
10.	Churee	.34	4.24	.06	2.80	-	5.86	8.34	12.13	69.00
11.	Dungarpur	17.43	3.88	19.80	10.67	.36	6.56	5.79	3.02	32.30
12.	Ganganagar	1.83	5.67	.57	1.15	.45	10.52	2.14	9.83	68.36
13.	Jaipur	4.96	5.40	8.03	7.92	.12	5.76	7.52	8.28	51.90
14.	Jaisalmer	1.21	1.45	8.79	2.31	.00	77.01	1.21	1.16	6.81
15.	Jalor	1.71	3.31	8.05	4.83	.02	2.81	11.87	11.17	58.12
16.	Jhalawar	16.73	3.94	7.26	8.35	.11	12.13	1.63	1.83	47.72
17.	Jhujhnun	5.73	2.80	3.07	7.52	.06	1.44	2.70	4.39	72.31
18.	Jodhpur	.14	3.38	6.47	5.35	.02	2.96	18.65	11.39	51.60
19.	Kota	25.95	3.67	8.76	4.61	.04	4.53	4.17	3.58	44.56
20.	Nagaur	.83	4.51	3.35	4.32	.06	.77	6.07	15.10	64.95
21.	Pali	6.03	4.05	12.27	7.53	.01	3.30	11.02	11.92	43.83
22.	S. Madhopur	19.70	4.60	14.09	6.55	.06	3.12	2.51	4.41	44.89
23.	Sikar	1.78	3.26	7.37	6.22	.01	1.80	5.95	9.81	63.75
24.	Sirohi	27.64	4.66	17.85	6.46	.01	2.53	5.88	6.03	28.89
25.	Tonk	3.15	4.81	5.49	8.99	.01	8.08	3.19	6.00	60.24
26.	Udaipur	13.40	12.42	24.67	8.74	.03	13.23	2.71	1.98	17.78
	RAJASTHAN	6,07	4.40	8.57	5.36	.06	18.52	6.25	6.85	43.86

RAJASTHAN

AGRICULTURAL AND TECHNOLOGICAL VARIABLES

(1970-71)

Appendix VI

S. N.	Districts	Cropping intensity	Man-land ratio	Agricultural Productivity	Labour Productivity	Optimum carrying capacity of the Land	Proportion of net irrigated area to net sown area	Proportion of gross irrigated area to gross cropped area	Irrigation intensity	Use of tractors per '000 ha of net sown area	Use of Oil engines/ electric pumps per '000 ha. of net sown area
1.	Ajmer	114.50	.81	785.24	1798	172	19.75	21.62	125.16	.32	4.37
2.	Alwar	136.00	.42	1637.67	3737	323	17.80	14.18	108.34	2.21	11.58
3.	Banswara	125.09	.46	1733.60	2700	417	5.65	4.67	103.36	.09	4.99
4.	Barmer	100.43	3.32	415.98	1912	121	1.10	1.39	126.40	.17	1.39
5.	Bharatpur	122.29	.45	1803.34	3466	372	26.26	23.39	108.94	3.05	12.55
6.	Bhilwara	128.67	.74	1155.96	1504	347	40.50	39.39	125.18	.47	6.18
7.	Bikaner	100.09	7.69	135.64	815	38	.28	.30	109.31	.02	.04
8.	Bundi	115.51	.76	1540.73	3884	359	42.10	40.31	110.60	.40	2.21
9.	Chittorgarh	126.56	.78	1567.00	2326	407	26.95	24.42	114.71	.24	15.05
10.	Churu	101.30	2.52	349.96	2211	85	.01	.03	195.41	.43	.08
11.	Dungarpur	133.21	.34	1526.68	1914	343	10.02	8.53	113.33	.06	4.46
12.	Ganganagar	108.64	1.68	1489.36	6688	275	43.30	47.20	118.43	2.17	.85
13.	Jaipur	114.24	.61	1312.94	2772	328	26.07	24.86	108.96	1.39	21.67
14.	Jaisalmer	100.01	14.77	141.27	449	40	.24	.25	101.47	.16	.31
15.	Jalor	105.72	1.36	828.86	2906	205	8.00	10.55	139.50	.29	7.60
16.	Jhalawar	115.19	.72	1192.63	2064	255	11.10	10.17	105.51	.04	5.95
17.	Jhunjhunun	111.58	.62	683.07	2153	157	3.15	3.13	117.44	.14	3.93
18.	Jodhpur	100.77	2.43	516.78	2735	125	2.18	2.74	126.68	1.33	2.19
19.	Kota	108.50	.88	1355.85	3576	287	22.71	22.34	106.72	.58	3.63
20.	Nagaur	101.85	1.38	485.00	1517	114	1.71	2.60	133.22	.67	1.82
21.	Pali	105.69	1.01	1032.60	2064	216	15.47	17.31	118.28	1.35	5.13
22.	S.Madhopur	116.36	.56	1739.75	3013	324	19.80	17.55	103.24	.35	5.03
23.	Sikar	105.03	.73	821.78	2374	211	6.56	6.85	110.73	.44	5.79
24.	Sirohi	113.20	.70	1366.63	2525	263	22.42	24.09	121.60	.38	9.77
25.	Tonk	107.51	1.09	1013.14	2922	219	15.40	15.08	105.32	.17	2.67
26.	Udaipur	131.02	.42	1936.82	1783	453	30.20	26.49	114.92	.21	8.23
	Rajasthan	109.72	1.18	1167.55	2821	238	14.61	15.30	114.90	.80	5.02

RAJASTHAN

AGRICULTURAL AND TECHNOLOGICAL VARIABLES

Appendix VII

(1980-81)

S.N.	Districts	Cropping intensity	Man-land ratio	Agricultural Productivity	Labour Productivity	Optimum carrying capacity of the Land	Proportion of net irrigated area to net sown area	Proportion of gross irrigated area to gross cropped area	Irrigation intensity	Fertilizers consumption kg/ha.	1977 Use of tractors per '000 ha of net soun area	1977 Use of Oil engines/ pumps per '000 ha. of net soun area
1.	Ajmer	123.12	.69	782.10	1299	201	28.30	30.27	131.70	4.09	.88	11.24
2.	Alwar	132.89	.35	1937.62	3652	441	42.71	36.00	111.90	9.44	4.09	37.69
3.	Banswara	132.16	.33	1027.76	1430	227	10.90	8.77	106.52	7.37	.15	17.19
4.	Barmer	102.07	2.04	168.60	885	38	1.54	2.44	162.27	.21	.29	1.45
5.	Bharatpur	122.53	.37	1549.68	2384	385	37.00	37.92	105.72	8.34	5.63	32.77
6.	Bhilwara	138.41	.55	1846.96	2056	240	43.11	44.78	143.15	11.78	1.71	19.64
7.	Bikaner	104.52	4.91	183.80	1236	30	2.85	4.07	151.76	3.77	.12	.04
8.	Bundi	128.67	.61	2056.84	4398	413	48.52	48.13	127.63	30.78	2.20	9.90
9.	Chittor	143.88	.57	1854.82	2599	270	30.97	28.58	132.66	21.80	1.03	40.03
10.	Churu	108.67	1.86	429.33	2217	82	.04	.08	224.48	.02	.08	.19
11.	Dungarpur	140.89	.21	1440.46	1689	348	8.04	10.58	185.39	3.63	.09	1.83
12.	Ganganagar	123.16	1.17	1719.33	7228	350	47.32	53.33	138.80	25.09	5.30	2.25
13.	Jaipur	125.49	.47	1427.51	2558	357	46.50	45.80	123.59	9.22	2.70	36.57
14.	Jaisalmer	100.08	15.74	28.07	155	8	.04	.05	109.01	.05	.15	.14
15.	Jalor	117.16	1.06	609.75	2092	87	22.90	22.89	117.15	2.86	1.29	17.23
16.	Jhalawar	123.51	.57	960.16	1614	241	12.92	11.80	112.85	5.75	.22	18.17
17.	Jhunjhunun	122.77	.50	549.37	1528	128	13.37	13.24	121.61	1.15	.37	11.43
18.	Jodhpur	103.02	1.75	258.62	1006	49	4.64	5.73	127.14	.05	1.82	2.84
19.	Kota	117.49	.66	1453.77	3751	342	29.00	28.90	117.24	22.58	1.42	8.65
20.	Nagaur	107.58	1.10	405.51	1232	93	5.21	6.09	125.62	1.04	1.30	3.17
21.	Pali	114.14	.82	869.02	2002	231	29.67	31.70	118.76	8.23	2.38	11.80
22.	S.Madhopur	118.68	.43	1220.38	2113	285	28.00	25.10	106.86	13.13	.92	19.15
23.	Sikar	115.90	.57	734.17	1941	165	19.08	20.81	125.38	1.15	.81	15.31
24.	Sirohi	120.64	.50	1185.63	2335	214	36.77	37.59	123.30	8.58	1.49	22.44
25.	Tonk	112.56	.87	910.41	2491	214	19.65	20.16	115.51	3.43	.61	8.38
26.	Udaipur	146.53	.34	1667.70	1685	410	36.00	32.48	132.50	10.55	.66	27.44
	Rajasthan	116.12	.95	1042.28	2615	232	20.40	22.08	125.67	8.05	1.64	11.21

RAJASTHAN

PROPORTION OF AREA UNDER MAJOR CROPS IN GCA

(1970-71)

Appendix VII

S.No.	Districts	Bajra	Jowar	Maize	Wheat	Barley	Rice	Cereals	Gram	Tur	Pulses	Food Grains
1.	Ajmer	14.00	25.52	11.59	10.36	7.33	0.02	68.82	8.09	0.02	8.11	76.93
2.	Alwar	24.74	3.32	1.78	9.99	5.83	0.06	45.71	28.43	0.52	28.95	74.67
3.	Banswara	0.01	2.93	27.96	7.10	13.90	00.90	52.89	12.57	2.96	15.52	68.41
4.	Barmer	75.20	0.15	0.00	1.05	0.05	0.00	76.44	0.05	0.00	0.05	76.49
5.	Bharatpur	21.12	5.25	0.06	19.21	3.31	1.09	50.06	25.59	0.77	26.36	76.42
6.	Bhiluara	0.56	8.54	30.06	14.83	9.66	0.05	63.69	5.60	0.01	5.61	69.29
7.	Bikaner	39.80	0.14	0.00	0.05	0.01	0.00	40.00	0.02	0.00	0.02	40.02
8.	Bundi	0.20	21.46	8.22	30.95	3.40	2.74	66.97	16.42	0.04	16.46	83.43
9.	Chittor	0.02	14.17	20.83	19.38	1.56	0.67	56.62	5.66	0.26	5.92	62.54
10.	Churu	36.35	0.04	0.00	0.04	0.00	0.00	36.42	4.56	0.00	4.56	40.98
11.	Dungarpur	0.65	1.28	33.01	10.65	3.12	16.86	65.57	12.77	0.86	13.63	79.20
12.	Ganganagar	11.44	0.40	0.09	12.20	2.58	1.02	27.74	32.20	0.01	32.21	59.95
13.	Jaipur	30.07	4.17	3.09	9.31	10.83	0.01	57.48	9.72	0.22	9.95	67.43
14.	Jaisalmer	77.52	1.19	0.00	0.82	0.01	0.00	79.54	0.12	0.00	0.12	79.66
15.	Jalor	60.87	0.38	0.09	6.27	0.33	0.01	67.96	0.30	0.00	0.30	68.26
16.	Jhalwar	1.28	36.64	10.03	13.12	0.57	0.41	62.06	7.47	0.78	8.24	70.31
17.	Jhunjhunun	44.46	0.07	0.00	1.15	1.39	0.00	47.16	8.63		8.63	55.79
18.	Jodhpur	56.64	1.45	0.01	2.19	0.11	0.00	60.40	0.21	0.00	0.21	60.61
19.	Kota	0.58	29.49	2.73	28.04	0.84	1.18	62.67	13.30	0.04	13.34	76.20
20.	Nagaur	45.89	6.22	0.06	1.95	0.86	0.00	54.97	0.67	0.00	0.67	55.64
21.	Pali	28.26	12.71	5.07	8.91	3.99	0.00	58.94	1.69	0.02	1.71	60.65
22.	S.Madhopur	23.68	10.31	0.76	15.25	5.54	1.15	56.71	18.55	0.35	18.91	75.61
23.	Sikar	46.82	0.03	0.06	2.35	2.99	0.01	52.26	3.73	0.02	3.75	56.01
24.	Sirohi	26.25	1.90	1.01	13.63	2.13	0.11	54.15	1.87	0.52	2.38	56.54
25.	Tonk	9.14	28.43	5.66	19.94	9.09	0.01	72.26	14.86	0.02	14.89	87.15
26.	Udaipur	0.20	5.92	40.80	13.61	8.99	3.26	72.78	5.86	0.13	5.99	78.77
	Rajasthan	30.57	6.86	4.85	9.78	3.04	0.77	55.87	9.52	0.17	9.69	65.56

Contd-2

S. No.	Districts	Seasmum	Rape & Mustard	Lineseed	G.Nut	Castor-seeds	Oilseeds	Sugarcane	Cotton
1.	Ajmer	7.86	0.03	0.10	2.22	0.00	10.22	0.05	2.88
2.	Alwar	3.35	12.96	0.00	0.15	0.00	16.46	0.07	0.00
3.	Banswara	3.04	0.01	0.01	2.61	0.46	6.13	0.42	12.23
4.	Barmer	1.02	0.02	0.00	0.00	0.01	1.06	0.00	0.00
5.	Bharatpur	4.87	13.55	0.17	2.79	0.00	16.99	0.64	0.01
6.	Bhilwara	7.78	0.01	0.22	4.04	0.01	12.05	1.04	8.03
7.	Bikaner	0.17	0.00	0.00	0.00	0.00	1.08	0.00	0.00
8.	Bundi	3.58	0.17	3.31	0.30	0.00	7.35	1.81	0.03
9.	Chittor	3.92	0.00	0.66	10.40	0.00	14.99	0.78	5.32
10.	Churu	0.13	0.03	0.00	0.00	0.00	0.17	0.00	0.00
11.	Dungarpur	2.55	0.07	0.24	0.23	0.00	3.09	0.50	1.05
12.	Ganganagar	0.02	2.50	0.00	0.01	0.00	2.54	0.79	8.10
13.	Jaipur	2.85	1.24	0.02	3.27	0.00	7.38	0.05	0.01
14.	Jaisalmer	0.03	0.01	0.00	0.00	0.00	0.04	0.00	0.00
15.	Jalor	5.02	0.88	0.00	0.01	0.02	5.93	0.00	0.11
16.	Jhalwar	2.04	0.00	3.37	3.79	0.00	9.31	0.40	7.96
17.	Jhunjhunun	0.00	0.81	0.01	0.00	0.00	0.82	0.00	0.00
18.	Jodhpur	4.44	0.08	0.00	0.00	0.00	4.52	0.00	0.05
19.	Kota	1.49	0.11	6.12	0.66	0.00	8.39	0.22	0.01
20.	Nagaur	6.56	0.08	0.00	0.32	0.00	6.96	0.00	0.04
21.	Pali	20.03	0.40	0.01	0.31	0.01	20.75	0.00	1.34
22.	S.Madhopur	2.21	0.33	0.89	6.15	0.00	9.58	0.29	0.00
23.	Sikar	0.04	0.85	0.00	0.50	0.00	1.39	0.01	0.00
24.	Sirohi	10.46	2.29	0.00	0.25	0.18	13.17	0.01	1.16
25.	Tonk	3.72	0.62	0.78	2.24	0.00	7.36	0.26	0.34
26.	Udaipur	3.90	0.26	0.14	3.35	0.01	7.66	1.10	2.62
	Rajasthan	3.28	1.70	0.47	1.37	0.02	6.83	0.24	1.66

RAJASTHAN

PROPORTION OF AREA UNDER MAJOR CROPS IN G.C.A.

(1980-81)

Appendix IX

Sl. No.	Districts	Bajra	Jawar	Maize	Wheat	Barley	Rice	Cereals	Gram	Tur	Pulses	Food grains
1.	Ajmer	9.81	24.94	12.24	13.57	5.52	0.04	66.21	7.49	0.01	7.50	73.71
2.	Alwar	27.72	1.94	2.08	20.56	6.38	0.07	59.11	13.77	0.33	14.10	72.88
3.	Banswara	-	1.87	30.32	10.79	1.16	15.61	59.70	11.14	2.96	14.10	73.80
4.	Barmer	66.61	0.07	-	1.28	0.04	-	68.01	0.12	-	0.12	68.13
5.	Bharatpur	30.33	4.39	0.06	21.01	4.64	0.67	61.13	9.32	0.63	9.95	71.08
6.	Bukiwara	0.24	6.23	32.76	15.90	5.04	-	61.22	5.21	-	5.21	66.43
7.	Bikaner	29.83	0.08	-	0.92	0.01	0.01	30.88	0.83	-	0.83	31.71
8.	Bundi	0.27	15.75	11.62	26.62	2.15	7.87	64.31	11.36	0.19	11.55	75.86
9.	Chittorgarh	0.02	10.47	23.21	15.62	1.39	0.59	51.41	13.72	0.32	14.04	65.45
10.	Churu	33.44	-	-	0.14	0.32	-	33.91	9.25	-	9.25	43.16
11.	Dungarpur	0.08	0.19	30.34	14.23	1.83	19.22	65.93	8.48	0.82	9.30	75.23
12.	Ganganagar	4.07	0.14	0.05	14.69	0.85	1.07	20.91	31.35	0.07	31.42	52.33
13.	Jaipur	26.23	3.67	3.04	18.32	8.27	-	59.57	9.76	0.19	9.95	69.52
14.	Jaisalmer	69.01	1.02	-	0.51	-	-	70.60	-	-	-	70.60
15.	Jalor	42.65	0.26	0.12	7.09	0.52	-	50.72	1.28	-	1.28	52.00
16.	Jhalwar	0.1	36.53	14.18	9.47	0.29	0.37	61.31	11.33	1.21	12.54	73.85
17.	Jhunjhunun	45.17	0.05	-	6.27	5.71	-	57.22	5.09	-	5.09	62.31
18.	Jodhpur	50.21	0.45	0.02	3.46	0.08	-	54.24	0.86	-	0.86	55.10
19.	Kota	0.53	28.27	4.95	23.48	1.12	2.52	60.91	14.56	0.10	14.66	75.57
20.	Nagaur	41.06	3.90	0.11	3.09	0.96	-	49.14	2.07	-	2.07	51.21
21.	Pali	15.12	6.55	6.15	13.84	3.85	-	45.54	4.42	0.06	4.48	50.02
22.	S.Madhopur	26.50	11.33	0.84	19.76	4.20	0.81	63.47	9.81	0.26	10.47	73.54
23.	Sikar	40.57	0.04	0.04	6.62	3.32	-	50.62	5.42	0.02	5.44	56.06
24.	Sirohi	8.13	2.47	13.67	15.14	2.13	0.08	41.66	4.18	0.87	5.05	46.71
25.	Tonk	6.22	26.08	5.47	23.50	4.81	-	66.11	10.38	-	10.38	76.49
26.	Udaipur	0.03	2.93	40.86	15.44	6.61	3.32	68.99	5.70	0.29	5.99	74.98
	Rajasthan	27.22	5.39	5.15	10.46	2.45	0.94	51.65	8.64	0.17	8.81	60.46

Contd.-2

Sl. No.	Districts	Seasmum	Rape & Mustard	Linseed	Groundnut	Castorseed	Oilseeds	Sugarcane	Cotton
1.	Ajmer	1.82	0.14	0.26	4.73	-	6.95	0.03	3.99
2.	Alwar	1.29	6.68	-	0.11	-	8.08	0.06	0.01
3.	Banswara	0.31	0.49	0.43	0.53	0.11	1.87	0.25	6.83
4.	Barmer	0.79	0.97	-	-	0.03	1.79	-	-
5.	Bharatpur	1.35	11.78	0.77	1.85	-	15.75	0.36	0.03
6.	Bhilwara	3.24	0.09	0.55	3.36	-	7.24	0.33	6.78
7.	Bikaner	2.42	0.73	-	0.04	-	3.19	0.01	0.23
8.	Bundi	4.26	0.30	0.73	0.46	-	5.75	3.14	-
9.	Chottorgarh	2.17	0.35	1.58	5.89	-	9.99	0.68	1.86
10.	Churu	0.09	.22	-	-	-	0.31	-	-
11.	Dungarpur	0.75	0.03	1.31	0.09	-	2.18	0.39	0.53
12.	Ganganagar	-	3.48	-	0.08	-	3.56	0.23	14.60
13.	Jaipur	1.40	0.83	0.02	3.99	0.02	6.26	0.05	-
14.	Jaisalmer	0.32	-	-	-	-	0.32	-	-
15.	Jalor	3.58	11.63	-	,-	0.23	15.44	-	0.22
16.	Jhalawar	1.82	-	2.14	2.30	-	6.26	0.24	3.06
17.	Jhunjhunun	-	1.86	-	0.03	-	1.89	-	0.02
18.	Jodhpur	3.87	1.65	-	0.09	-	5.61	-	0.10
19.	Kota	3.00	0.71	3.49	0.87	-	8.07	0.12	-
20.	Nagaur	6.06	2.26	0.02	1.39	-	9.67	0.01	0.12
21.	Pali	12.46	7.61	0.01	.52	0.05	20.65	-	2.80
22.	S.Madhopur	1.73	4.48	2.07	5.12	-	13.40	0.18	-
23.	Sikar	0.04	0.19	0.17	0.29	-	0.69	0.01	-
24.	Sirohi	5.90	6.89	-	0.83	0.99	14.64	-	2.46
25.	Tonk	0.93	0.54	.64	4.38	-	6.49	0.19	0.16
26.	Udaipur	1.69	1.17	0.22	1.34	-	4.42	1.41	1.50
	Rajasthan	2.24	2.60	0.39	1.27	0.02	6.52	0.19	2.15

Area and Production of Major Crops.

Rajasthan (1970-71).

(Area in '000 ha.)
Production '000 tonnes).

Appendix X

S.No.	Districts	Bajra		Jowar		Maize		Wheat		Barley		Rice		Gram		Tur	
		Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1.	Ajmer	63	32	115	23	52	29	47	47	33	38	.08	.03	36	14	.08	.01
2.	Alwar	167	66	22	9	12	7	67	114	39	55	.39	.22	192	156	3	2
3.	Banswara	.03	.01	7	3	71	71	18	23	2	4	35	50	32	15	7	5
4.	Barmer	791	224	2	.5	.02	.01	11	13	.47	5	-	-	.49	.22	--	--
5.	Bharatpur	137	105	34	12	.41	.18	124	183	21	28	7	3	166	129	5	1
6.	Bhilwara	2	.77	35	5	122	106	60	70	39	49	.19	.06	23	10	.01	.03
7.	Bikaner	231	21	.82	.28	--	--	.28	.33	.07	.04	.02	.01	.09	.04	-	-
8.	Budni	.50	.22	56	25	21	16	80	103	9	11	7	7	43	24	.10	.02
9.	Chittorgarh	.06	.02	62	28	91	115	84	112	7	9	3	2	24	10	1	.44
10.	Churu	443	83	.43	.09	-	--	.44	.53	.06	.03	--	--	55	21	--	--
11.	Dungarpur	1	.34	2	.71	53	51	17	22	5	7	27	19	20	10	1	.83
12.	Ganganagar	156	46	5	2	1	1	167	199	35	24	14	27	440	254	.04	.02
13.	Jaipur	281	153	39	10	29	19	87	119	101	151	.04	.05	91	69	2	.88
14.	Jaisalmer	89	7	1	.51	--	--	.94	1	.06	00	--	--	.14	.05	--	--
15.	Jalor	395	166	2	.62	.57	.30	41	53	2	2	.05	.00	2	.72	.05	.01
16.	Jhalawar	4	1	125	71	34	25	45	39	2	2	1	.91	25	13	3	1
17.	Jhunjhunon	225	92	.34	.11	.01	.09	6	7	7	8	--	--	44	13	--	--
18	Jodhpur	649	176	11	3	.14	.10	25	33	1	1	00	--	2	1	--	--
19.	Kota	4	1	187	102	17	4	178	177	5	7	7	9	84	50	.24	.15
20.	Nagaur	560	140	76	15	.74	.57	24	22	10	11	--	--	8	3	--	--
21.	Pali	164	68	73	20	29	17	51	56	23	26	.02	.00	18	4	.11	.01
22.	S. Madhopur	138	89	60	34	4	3	89	105	32	38	7	5	108	78	2	.69
23.	Sikar	273	109	.19	.06	.35	.20	14	14	17	31	.03	.01	21	16	.11	.02
24.	Sirohi	47	14	3	.67	18	24	26	34	4	4	.20	.05	3	1	.93	.23
25.	Tonk	45	22	139	37	28	12	97	75	44	51	.05	.02	72	38	.12	.07
26.	Udaipur	.91	.33	27	9	186	227	62	80	41	65	15	8	27	18	.58	.25
	Rajasthan	4868	1618	1092	411	772	733	1557	1704	484	622	123	131	1516	954	28	14

contd.-2

S.No.	District	Sesamum		Rape & Mustard		Lineseed		Groundnut		Castorseed		Surgarcane		Cotton	
		Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Productio
1.	Ajmer	35	3	.13	.06	.45	.08	10	6	-	-	.21	5	13	12
2.	Alwar	23	1	87	51	.01	.00	1	.55	-	-	.47	14	.01	.01
3.	Banswala	7	.78	.02	.01	.01	.00	7	5	1	.37	1	34	31	26
4.	Burmer	11	1	.26	.128	-	-	.02	.01	.14	.07	--	--	.02	.02
5.	Bharatpur	3	.37	88	45	1	.42	18	14	.02	-	4	62	.05	.05
6.	Bhilwara	31	4	.02	.01	.85	.20	16	7	.02	-	4	33	32	26
7.	Bikaner	5	.04	1	.48	-	-	--	--	-	-	--	--	--	--
8.	Bundi	3	1	.43	.20	9	2	.79	.57	--	--	5	127	.06	.06
9.	Chittorgarh	17	3	.02	.01	3	.86	45	29	.00	--	3	102	23	16
10.	Churu	1	.01	.38	.25	-	-	--	--	--	--	--	--	.00	--
11.	Dungarpur	4	.29	1.10	.07	.39	.12	.37	.23	00	00	.81	22	2	2
12.	Ganganagar	.31	.00	34	26	.04	.01	.14	.10	.00	00	11	271	111	131
13.	Jaipur	26	2	11	4	.21	.06	30	19	.01	00	.45	10	.05	.04
14.	Jaisalmer	.03	.00	.01	.01	-	-	--	--	--	00	--	--	--	--
15.	Jalor	32	6	5.00	4	.01	.00	.04	.02	.13	.04	.02	.65	.68	.63
16.	Jhalawar	7	.78	.00	.00	11	4	13	8	--	--	1	14	27	12
17.	Jhunjhunon	.01	00	4.00	1	.03	.01	--	.02	--	--	.00	.09	00	--
18.	Jodhpur	51	10	.87	.64	--	--	.01	.03	.01	00	.00	.09	.56	.53
19.	Kota	9	1	.69	.35	39	13	4	3	--	00	1	29	.03	.02
20.	Nagaur	80	10	1	.84	.01	--	4	2	--	00	.03	.93	.52	.49
21.	Pali	116	15	2	1	.04	.01	2	.80	.07	.02	.00	.10	8	8
22.	S.Madhapur	13	3	2	7	5	1	36	24	--	--	2	66	.00	.00
23.	Sikar	.22	.02	5	1	.00	-	3	2	--	--	.05	2	.00	--
24.	Sirohi	19	2	4	2	-	-	.44	.21	.32	.29	.00	.33	2	2
25.	Tonk	18	2	3	1	4	.69	11	7	--	--	1	37	2	1
26.	Udaipur	18	3	1	.71	.64	.19	15	7	.02	.01	5	170	12	7
	Rajasthan	523	72	271	149	75	24	217	133	2	.86	38	1030	265	247

RAJASTHAN

AREA & PRODUCTION OF MAJOR CROPS

(1980-81)

Appendix XI

Area in '000 ha
Product in '000 tonnes

S. No.	District	Bajra		Jowar		Maize		Wheat		Barley		Rice		Gram		Tur	
		Area	Production.	Area	Production	Area	Prodduction	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1.	Ajmer	43.00	14	110	2	54	20	60	76	25	33	.19	.14	33	15	.05	.00
2.	Alwar	176.00	109	12	6	13	6	131	244	41	64	.48	.35	87	82	2.00	.43
3.	Banswara	.00	-	5	3	85	42	30	29	3	4	44.00	17.00	31	19	8.00	3.00
4.	Barmer	1000	70	1	.21	.04	.02	19	23	.60	.80	-	-	2	1	-	-
5.	Bharatpur	171.00	111	25	10	.35	.15	119	178	26	37	4.0	1.0	53	49	3.00	0.33
6.	Bhilwara	.98	.16	25	6	133	97	65	213	25	29	.06	.04	21	10	0.03	0.00
7.	Bikaner	264.00	4	.7	.17	.02	.01	8	12	.11	.15	.11	.07	7	4	0.04	0.02
8.	Bundi	0.80	.14	45	14	333	21	76	106	6	7	23	28	33	28	0.56	0.18
9.	Chittorgarh	0.11	.02	52	34	114	134	77	118	7	8	3	1	68	47	2.00	0.43
10.	Churu	423	45	.07	.02	.00	.00	2	2	4	8	-	-	117	55	-	-
11.	Dungarpur	.15	.02	.34	.15	52	45	24	29	3	5	33	16	15	9	1	0.50
12.	Ganganagar	71	22	3	.62	.95	.74	255	401	15	12	19	37	545	329	1	1.00
13.	Jaipur	239	104	33	2	28	17	167	284	75	101	.04	.03	89	62	2	0.47
14.	Jaisalmer	181	1.5	3	.47	-	-	1	1	-	-	-	-	.12	.07	-	-
15.	Jalor	307	25	2	.10	.91	.57	51	45	4	4	.05	.03	9	6	.00	-
16.	Jhalawar	2	.6	136	62	53	44	35	34	1	1	1	1	42	22	4	1
17.	Jhunjhunun	238	37	.26	.04	.02	.01	33	42	30	20	00	-	27	5	.00	-
18.	Jodhpur	602	26	6	.10	.24	.15	42	46	1	1	-	-	10	7	-	-
19.	Kota	3	.58	184	112	32	33	153	186	7	7	16	18	95	68	.69	.27
20.	Nagaur	506	66	48	3	2	.90	38	47	12	16	.00	.00	26	13	-	-
21.	Pali	40	8	39	.70	37	22	83	102	23	26	.03	.02	26	15	.37	.04
22.	S.Madhopur	149	75	64	17	5	2	111	136	24	25	5	1	55	36	1	.29
23.	Sikar	232	51	.24	.04	.27	.12	38	45	19	28	.05	0.04	31	10	.11	.05
24.	Sirohi	15	2	4	.73	25	16	27	34	4	5	.15	.11	7	5	2	.04
25.	Tonk	30	9	127	20	27	9	115	97	23	32	.01	.01	51	32	.05	.00
26.	Udaipur	.15	.02	15	5	204	190	77	107	33	44	17	9	27	19	1	.57
	Rajasthan	4748	782	941	300	899	702	1826	2678	428	530	165	130	1508	950	31	10

S.No.	Districts	Sesamum Area	Sesamum Production	Lineseed Area	Lineseed Production	Groundnut Area	Groundnut Production	Castorseed Area	Castorseed Production	Sugarcane Area	Sugarcane Production	Cotton Area	Cotton Production
1.	Ajmer	.62	.40	1	.31	21	3	-	-	.16	6	18	16
2.	Alwar	42	31	.02	.01	.70	.25	00	-	.40	14	.09	.11
3.	Banswara	1	.26	1	.31	1	.65	.31	.10	.70	23	19	8
4.	Barmer	15	9	.00	.00	-	-	.54	.18	-	-	.02	.02
5.	Bharatpur	66	55	4	1	10	3	.04	-	2	34	.22	.27
6.	Bhilwara	.37	.22	2	.33	14	7	.01	00	1	42	27	24
7.	Bikaner	6	4	-	-	.42	.22	-	-	.10	4	2	2
8.	Bundi	.66	.53	2	.49	1	.50	.00	-	9	366	.01	.01
9.	Chittorgarh	2	1	8	2	29	26	.01	-	3	122	9	7
10.	Churu	3	2	-	-	.00	.00	-	-	-	-	-	.00
11.	Dungarpur	.85	.03	2	.75	.16	.06	.02	.02	.67	26	.92	1
12.	Ganganagar	60	46	.03	.00	1	.66	.00	.00	4	25	254	333
13.	Jaipur	8	6	.22	.07	36	10	.21	.11	.47	17	.08	.09
14.	Jaisalmer	.03	.02	-	-	-	-	-	-	-	-	-	-
15.	Jalor	54	42	00	-	.00	.00	2	.43	01	.25	2	2
16.	Jhalawar	.09	.05	8	2	9	5	.00	-	.89	37	11	3
17.	Jhunjhunun	10	7	.05	-	.17	.05	-	-	.01	.58	.15	.16
18.	Jodhpur	20	12	.10	.02	1	.36	.05	-	.01	.04	1	1
19.	Kota	5	3	22	6	6	4	.03	-	.80	34	.01	.01
20.	Nagaur	28	10	.32	.10	17	2	-	-	.13	5	1	2
21.	Pali	46	19	.09	.03	3	1	.35	.12	.01	.38	17	19
22.	S.Madhopur	25	15	12	.00	29	13	.01	-	1	33	.01	.02
23.	Sikar	1	7	.97	.33	2	.58	-	-	.09	3	.03	.03
24.	Sirohi	12	7	.03	-	1	.60	2	.19	.04	.16	4	5
25.	Tonk	3	1	3	.69	21	5	-	-	.92	27	.82	.93
26.	Udaipur	6	3	1	.25	7	4	-	-	7	293	7	6
	Rajasthan	454	285	69	20	222	88	5	1	33	1245	376	433