# POPULATION PRESSURE AND LAND USE PATTERN IN INDIA: A STATE LEVEL ANALYSIS (1971-2001)

*Dissertation submitted to School of Social Sciences, Jawaharlal Nehru University in partial fulfillment of the requirement of the award of the degree of*

**MASTER OF PHILOSOPHY**


*Submitted by*

**BHASKAR DEO**




**CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT**
**SCHOOL OF SOCIAL SCIENCES**
**JAWAHARLAL NEHRU UNIVERSITY**
**NEW DELHI-110067**
**INDIA**


**2003**

जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

# CERTIFICATE

I, Bhaskar Deo, certify that the dissertation entitled **"POPULATION PRESSURE AND LAND USE PATTERN IN INDIA: A STATE LEVEL ANALYSIS (1971-2001"** for the degree of **MASTER of PHILOSOPHY** is my bonafide work and may be placed before the examiners for evaluation.

Bhaskar Deo
(BHASKAR DEO)

Forwarded by

Aslam Mahmood
PROF. ASLAM MAHMOOD
CHAIRPERSON

Sudesh Nagia 21.7.2003
PROF. SUDESH NAGIA
SUPERVISOR

Tel. : 610 7676, 616 7557 Ext. 4463, 4466 Gram : JAYENU Fax : 91-011-6165886, 619 8234

## *Acknowledgement*

*Although 'thanks' is a poor expression of the deep sense of gratitude one feels in the heart, yet there is no other way to express it.*

*This work would not have been complete without the help of various people who have contributed to it to their own way. No words are sufficient enough to express my gratitude to my supervisor, Prof. Sudesh Nangia, who had been the ultimate mentor. Her constant encouragement acted as the driving force for me and helps me to develop an interest for the subject. Moreover, her immense patience to bear with all my shortcomings and enthusiastically correcting me whenever I went wrong has been of great help. Her critical comments and suggestions from time to time were also very helpful for my research. I am very much thankfull to her for being such a friendly and helpful supervisor.*

*I would also like to express my thanks to all other faculty members and staff for helping me.*

*I am highly appreciative of the help, company and moral support provided by my friends, Ajeet Singh, Atul K.Mishra, Atul Kumar, Amit Sachan, Mithilesh Kumar Yadav, Ajim Ansari, Anima Vernwal, Moni Sahay, Jeetendra D Soni, K.K. Moumita, Mili, Manish, Pramod, Poloumi, Paro, Pawan with whom I enjoyed a lot during my research work.*

*Though last yet most important, I am grateful to my parents, whose invaluable support and encouragement throughout has helped me to complete this work. Their unselfish sacrifices and well wishes have provided strength at the most crucial point of my life and it is because of them that I have reached this level.*

*Bhaskar Deo*

# CONTENTS

## LIST OF TABLES

## LIST OF FIGURE

# Introduction

## Chapter One

# CHAPTER 1

## INTRODUCTION

**Introduction:**

Understanding the dynamics of land use change is a scientific challenge of considerable importance to humanity. Some of the most profound changes in the landscape have arisen from direct decisions by man concerning land use, and these have affected both the quality of environment resources, such as soil and water and the sustainability of food production.

The study of land use is an inevitable as the problem aggravated by the alarming rate of increase in human population and widening ratio of land to man and threatening process to carrying capacity of the land. Thus it determines all the productive and economic activities( Daya Ram[1] 2002). The amount of land and land-based resources is finite. Hence land is scarce in supply. It is irreplaceable and not reproducible. Whereas the land is finite, the population dependant on the land and their needs are not limited. They have been increasing over time. Per capita availability of this resource is therefore declining. The position of cultivated land is also similar. The pressure of increasing population on land has already broad forth-damaging effect on natural resources and ecosystem.

Land use changes with time to meet the variable demands on the land by the society in its new ways and conditions of life. The demand of new uses of land may be inspired by a technological change or by a change in size, composition and requirement

[1] Daya Ram: Land Use in Haryana: Past, Present and Future, Geographical Review of India, vol. 64 (2) (June 2002), pp 148

of a community. In a situation where land is limited resource for crop production, stringent and competing demands arising out of the ecological needs, food and fodder requirement, industrial raw- materials etc. would pool the resource use in a ad hoc-manner keeping up pace with troughs and peaks of the price fluctuation in the community market. Thus the study on changes in land use is very necessary (Dahiya[2] 1988).

The utilization of land resources forms a major item in national planning and this is especially so in India where more than seventy percent of population depends directly on land the rapid increase of population pressure on our land at most case in this respect. As attempts are being made to modernize agriculture, land use mapping, its analysis and interpretation together with the classification of land, are of vital importance.

The physical, economic and institutional framework taken together determines the pattern of land use of a country at any particular time. In other words, the existing land use pattern in different regions in India has been evolved as a result of the action and interaction various factors, such as physical characteristics of land, the institutional framework, the structure of other resources (capital, labor, etc.) available, and the location of the region in relation to other aspect of economic development e.g., those relating to transport as well as industry and trade. The present can, therefore, be considered in some sort of static harmony and adjustment with other main characteristics of the economy, of the region. A close study of the present land use pattern and other trends during recent years will help to suggest the scope for plan shifts in the pattern.

[2] Dahiya, I.S., soil geography of Haryana. Publication Division, Haryana Agricultural University, Hissar (Haryana)

**Statement of the Problem:**

Land is not only an important factor of production, but also the basic means of subsistence for majority of people in India. Agriculture contributes about 30 percent of Gross Domestic Product of India, but includes nearly 65 percent of the total working population. About 75 percent of the total population draws their livelihood from agriculture. Land is required for both agriculture and non-agricultural purposes, including establishment of Industries, housing, roads, parks, railway lines etc. Continuously increasing pressure of population is bringing about significant changes in land use pattern and consequently increasing pressure of population on land. Conversion of agricultural lands to non-agricultural uses poses a real threat to sustainability of livelihood system of common people. Due to both population growth and urbanisation, there is growing demand for conversion of agricultural lands to non-agricultural uses. Under unbridled market forces, there is growing problem of land degradation in many regions, due to over-exploitation of land, water, forest and other natural resource.

**Land Use Classification:**

Till 1949-50, the land area in India was classified into five categories known as the five-fold land use utilization classification. This five–fold land utilization classification was however, a very broad outline of land use in the country and was not found adequate enough to meet the needs of agricultural planning in the county. The states were also finding it difficult to present comparable data according to this classification, owing to the lack of uniformity in the definition and scope of classification covered by these five broad categories. To remove the non- comparability and to break up the broad categories into smaller constituents for better comprehension, the

Technological Committee on Co-ordination of Agriculture Statistics, set up by the Ministry of Food and Agriculture, recommended in a nine – fold land use classification replacing the old five- fold classification. The statement below gives the 'Nine-fold classification':

1. Forest.
2. Land use put to non-agricultural uses.
3. Barren & uncultivated land.
4. Permanent pasture and other grazing lands.
5. Miscellaneous tree crops and grooves, not included in the net shown area.
6. Cultivated waste.
7. Fallow land, other than current fallows.
8. Current fallows.
9. Net area shown.

Standard definition of various character of land use adopted in Land Utilization Statistics are given in Appendix 1.

**Population and Agricultural Land Use:**

**Theoretical Background:**

The interrelationship between population growth and food production has been the focus of discussion ever since the secular trends of human societies attracted the attention of social scientist. Some of the scholars have been interested in showing the effects of agriculture condition on the demographic condition. This is approach with Malthusian thought, while some others have conversely tried to study the effect of population change on agriculture. This is the Boserupean approach of thinking on

population and agrarian relationships in a region. Population is treated as a dependent variable in the former and as a dependent variable in the later school.

Malthus[3] in his classic essay, "A summary view on the principle of population", propounded that population has a tendency to grow in a 'geometric progression' and thus doubling every twenty-five years. Food supply at best could increase in arithmetic progression. Thus, the power of population is infinitely greater than the power of land to provide subsistence to human beings and in a period of a century the ratio of population to food production would be 16 to 5. Malthus and his followers argued that lack of food is the principle ultimate check to population growth. Means of subsistence are visualized not to increase as fast as potential population growth, because of "scarcity of land" and "the decreasing proportion of produce which must necessarily be obtained from continued additions of capital applied to land already in cultivation". Limits to the amount of food production are, therefore, supposed to create the ceiling to population growth, if not by prevented measures then by the positive inroads of starvation, disease, war etc. Thus, there is a total population beyond which further increase inevitably depresses living standards leading to a situation of overpopulation. Food supply in Malthusian thought is thus considered as possessing the power of regulating population size.

Malthusian concept was later challenged by Ester Boserup[4], which is based on logic that in a pre-industrial society an increase in population stimulates a change in agricultural techniques so that more food can be produced to support the increasing

[3] T.R. Maltus,(1970) " A summary view of principle of population", in G.J.Demoko, et al (eds.) Population Geography: A Reader. New York; McGraw-Hill, pp.44-70.
[4] Boserup, E. (The Condition of agricultural Growth: The Economics of Agrarian Change under Population Pressure, London, Allen and Unwin.

population numbers. After examining different land use system of the world classified according to their intensity of production, Boserup assert that there are a close connection between agricultural techniques and the type of land use system. Unless population increase the adaptation of new agricultural techniques is unlikely. If population increases beyond a certain point and no extra land is available in order to maintain the same level of per capita consumption the length of fallow land would have to shorten. This would leads to a decline in soil fertility and output per man-hour. In such a situation, adaptation of new techniques would become necessary and advantageous and would therefore, be adopted. The growth of population, thus leads to agricultural development and growth of food supply.

**Literature review:**

L.D. Stamp in Britain[5] made one of the pioneer works in the study of land use pattern in the year 1930. The main objective of his work was to prepare land use map of Britain. The land use work of Stamp became the guideline for researchers not only in Britain but all over the world.

As regards land use studies in India, several scholars have looked into different aspect of land use studies. M. Shafi[6] (1966) in his paper entitled "Technique of Rural Land Use Planning with special Reference to India." brought out a scheme based on sampling techniques for land use survey of India.

[5] Stamp, L.D. (1948), The Land of Britain and How is Used, London: Longman, pp. 74-77.
[6] Shafi, M. (1972), Land Utilisation in Eastern Uttar Pradesh, Aligarh Muslim University, Aligarh.

E. Ahmad[7] (1954) has analysed land use types in respect of physical elements. He considered slope of the village as important factor to determine the land use pattern.

S.N. Mishra[8] (1969) in his study of land use in Khadar and Ravines land of the Lower Middle Gomati Valley has atteppted Land use environment for optimum exploit-tation and conservation of natural resources.

The study by V.R. Singh[9] (1970) involves measurement of land efficiency and classification of the different categories of land in the area. The shape, size and pattern of agricultural fields and their dynamics have been adequately analyzed within the physico-cultural framework.

Parsu R. Sharma[10] (1978) studied the land use and its efficiency of Chhattisgarh Region includes the study of land with a view to determining in what way and for what purpose a type of land resource may be used most efficiently.

The paper of B.S. Gupta, P.K. Saraswat and M.L. Purohit[11] (1998) focuses on changing pattern of land use and its efficiency in arid zone of Rajasthan. The efficiency is measured by calculating the ranking score on the basis of six variable e.g. net area sown, non cultivable land, cultivated and irrigated land, area cropped more than once and cropping intensity.

---

[7] Ahamad, E.(1954), Geographical Essay on India, Patna, pp15-16.
[8] Mishra, S.N. (1969), "Land Use in the Khadar and Ravine Tract of the Lower Middle Gomati Vally", National Geographical Journal of India,vol. 10, nos3 and 4.
[9] Singh V.R.: Land use pattern in Mirzapur and Environs, Banaras Hindu University, 1970, pp 49-62.
[10] Sharma, Parsu R.: Spatial Characteristics of Land use and its Efficiency: An Evaluation (A case study of Chhatisgarh region), National Geographer, vol. XIII, no. 1 (June 1978), pp 81-89.
[11] Gupta B.S.; Saraswat P.K. and Purohit M.L. : Changing Pattern of Land Use and its Efficiency in Arid Zone of Rajasthan, National Geographical Journal of India, vol. 44 (Mar-Dec 1998), pp 236-240.

Daya Ram[12] (2002) in his article investigates that in Hariyana state there is hardly any scope to increase the cultivable area in future as it is already reached the highest level. Comparative land use potentials have been studied in six physiographic zones of the states comprising Sivalik Hills, Piedmont and dissected rolling plains, Recent alluvial plains, Aeolian plains and sand dunes and Aravalli hills. He suggests that uttermost attention in the coming decades should be on increase area under forest, pulses, oilseeds, vegetable, fruits and legumes. To sustain land resource potential, decision on land use should be made in such a way that the responses of environment are put to the most beneficial use for man.

The article by Kamala Bhattacharya[13] (2002) is a study of agriculture land use with emphasis on irrigation, use of fertilizer and pesticides, augmentation of water supply by canal and tanks, setting up more service centers and efficient drainage system towards a balanced development of socio-economic conditions of Barddhaman block of Barddhaman District. Basic improvements of agriculture in terms of introduction of morden technology, opening of cooperative credit societies, improving relation between land owners and agricultural labourers must help the formers to achieve optimal land use to boost up the socio-economic status of the area.

Ravi S. Singh[14] (2000) makes an attempt to develop an understanding of existing land use pattern. As part of this discussion, changes between tow land use pattern census, i.e.1985-1986 and 1990-1991, are also considered. He also identifies levels of

[12] Daya Ram: Land Use in Haryana: Past, Present and Future, Geographical Review of India, vol. 64 (2) (June 2002), pp 148-56.
[13] Bhattacharya, Kamal: Agriculture Land Use in Barddhaman Block, Barddhaman District, Geographical Review of India, vol. 64 (march 2002), pp 69-71.
[14] Singh, Ravi, S. "Land Use and Levels of Agricultural Development in Arunachal Pradesh, National Geographical Journal of India, vol 46(1-4), mac-dec.,2000: pp 69-80

agricultural development. The development indices are worked out employing Bhatia's method. The studies suggest that forest cover has by and large remained unchanged almost in all districts. There is an increase in operational area and net area sown that marks development in agriculture. Similar trend is noticeable in case of area sown more than once. Simultaneously, decrease in the percentage area of fallow land, cultivable wasteland, and area not available for cultivationis has increasing trend. Finally it is submitted that the pace of development of agriculture is very slow in Arunachal Pradesh.

V.K.Pandey and S.K.Tiwari[15] (1996) discussed regional agriculture land use in their paper. The study focuses on land as scarce and exhaustible resources whose sectoral allocation and utilization or under utilization determine the aggregate land use and the nation's capability to feed the population. The authors analyse the land use statistics of fourteen agriculturally important states where the data are found to be consistent, covering the period triennium ending 1970-71 to 1990-91. They have worked out the compound growth rate for various land use classes for the selected states and the country as a whole. Providing an overview of the sectoral shares in land use, they grouped the total land endowment into three broad sectors: (a) ecological sector, comprising forests, permanent pasture and grazing land, miscellaneous tree crops, and barren and uncultivated land; (b) non agriculture sector and (c) agriculture sector comprising net sown area, fallow lands and culturable waste. They point out that by the end of end of sixties; India had already crossed the limit to extension of net cultivated area. It is argued that further tendency for extensive cultivation through land shifts from outside the

[15] Pandey, V.K. and Tiwari, S.K.: Regional agriculture land use: Indian Journal of Agriculture Economics, vol. 51(1-2), (Jan-June1996), pp 260-269.

agriculture sector need to be fully checked. While any generalised approach to achieve full utilization of irrigated and fallow lands across the states is too simplistic, the authors underscore the need for concerned efforts to bring all the irrigated area under intensive cultivation and all fallow lands under cultivation of region specific remunerative possibilities.

The Paper Agricultural Land use in the Planes of Assam by Chandrama Goswami (2002)[16] is study of agriculture land use at district level for the period from 1961-62 to 1997-98, aimed at three aspect of agricultural land use relate to extensive cultivation, intensive cultivation and under utilization of cultivable lands. The compound growth rates obtained from the estimated trained equations are used to examine the three aspects. His study shows that for extensive cultivation NAS remained almost constant during the study period and played a miner role in raising agricultural production, while gross area sown shows positive growth almost in all districts. In order to increase agriculture production, extensive cultivation through land shifts from out side agriculture sector is neither feasible nor possible. This can be best done through bringing most of the area cultivated under irrigation, and bringing all fallow lands under cultivation of region-specific remunerative crops.

P.C.Tiwari and Bhagwati Josi[17] (2000) present the study on optimal land use for sustainable development in Himalaqya-Ganga plains. Taking two period of time 1965 and 1995 they have discussed the changes took place in land use pattern and the impact

[16] Goswami, Chandrama: "Agricultural Land Use in the Plains of Assam", E.P.W., Dec. 7,2002; pp.4891-93.

[17] Tiwari, P.C. and Joshi Bhagwati: "optimal Land Use in Mountains for Sustainable Development: a Case study of Himalya- Ganga Plain, National Geographical Journal of India, vol 46 (1-4), Mar-Dec, 2000; pp 81-92

on environment due to changes in land use pattern. Finally they suggested the need of sustainable development.

Amal Kumar Ghosh and Dilip Kumar Khan[18] (2002) applied factor analysis for land use study in Bankura District of West Bengal. His study reveals that the district has both competitive and substitute nature of economy. The study suggested all round development in the district.

V. Ratna Reddy[19] (1991) in his paper bases his study on under-utilization of land in Andhra Pradesh. Attempt has been made to examine the trends in under-utilisation of lands across the districts of Andhra Pradesh over a period of thirty-three years (1955-56 to 1987-88). Besides, an attempt is also made to analyse the factors responsible for the variations across the districts and across size classes. They have taken net area sown, current fallows, other fallows and cultivable waste of land use category for the analysis of under-utilisation of land. The paper brings out clearly that the extent of under utilization of agricultural land is considerable and stresses the need for immediate concern in this regard. The advent of new technology did not make any dent on under utilization of land. On the contrary, it had aggravated the situation. Increase in under-utilisation land is more prominent in drought-prone districts whereas in the non-drought-prone districts it has increased marginally over the study period. However, the cross-sectional analysis (district wise) did not provide any evidences regarding the importance of rainfall in determining under-utilisation of land. On the other hand, economic and technological factors seem to play a dominant role. Thus it may be concluded that the extant of land utilization or

[18] Ghose Kamal Kumar and Khan, Dilip Kumar; " Land Use Pattern in Bankura District- A Factor Analysis Approach, Indian Journal of Regional Science, vol. 24, no. 1, 2002, pp 98-102.
[19] Reddy, V.Ratna: "Under Utilisation of Land in Andhra Pradesh: Extent and Determinants" , Indian Journal of Agricultural Economics, vol. 46, no. 4, Oct-Dec. 1991. pp 555-567.

under-utilisation largely depends on the availability of resources with the formers and the nature of investment in relation with the expected returns from land.

H.R.Yadav[20] (1986) found out that slope, ph value, Drainage density and local environmental condition are the major factors for formation of waste land in a region. He suggested that for increasing agricultural production, waste land reclamation should be adopted as a strategy for the extension of net area sown.

R.S.Dube[21] (1990) in his book entitled "Population Pressure Agrarian Change" makes an effort to adopt a conciliatory approach to the Malthusian and Boserupean dualism of population-resource dynamism and to present a new Cycle Theory on agrarian growth based on empirical trends as evidenced in Madhya Pradesh during the period 1951-1981.the books examines the Malthesion-Boserupean dichotomy with special reference to demographic situations obtaining in Madhya Pradesh. The temporal and special dimensions of population and agriculture interrelationships have been anaysed with a view to identifying trends of changes taking place in the Indian context. The study reveals that Malthusian and Boserupean forces have had intermittent operation, which constitutes parts of the long cycle of population-resource dynamics in this part of the world. The study also seeks to resolve the practical controversy between the theoretical controversy between theoretical postulates of Malthus and Boserup.

K.S. Rao and S.N. Nandy[22] (2001) in his paper "Land use Pattern and Population Pressure" makes an attempt to assess the land use changes over two decades (1974-1994) using district wise revenue records and its relation to population growth. All the districts

---

[20] Yadav, Hridai, Ram (1986); "Genesis and Utilisation of Waste lands" Concept Publishing Company, New Delhi, pp 1-239

[21] Duby, R.S.: Population Pressure and Agrarian Change, Rawat Publication, 1990, pp 50-62.

[22] Rao,K.S. and Nandy.S.N: Land use pattern and population pressure in Uttaranchal, ENVIS Bulletin: Himalayan Ecology & Development. Vol. 9,No.1, 2001. pp. 24-32.

are ranked according to the ascending order of exponential trend. Taking the general trends of statehood Uttaranchal as population mean, the deviation of individual districts for the respective parameters has been calculated. Three different measures viz. population density, physioghaphic density and agriculture density has been used to calculate the population pressure of Uttaranchal's districts.

The book "Land Utilisation and Population Distribution- a case study of West Bengal" by Jyotirmoy sen[23] (1988) presents the study of changes in the land use and population in Bhagirathi-Jalangi interflue, West Bengal during the period of one hundred thirty five years from 1850 to 1985, focusing attention on nature and degree of change in land use and population growth and decline, factors responsible for change-physical and socio-economic and the specific role played by each, the exact process of change and the effect of change on the ecology of micro-region. The study also aimed at investigating the part played by all factors severally and collectively in including the metamorphosis in land use settlement. In the course of the study it is observed that the interaction was a complex one in which all the factors, e.g. physical environment, economic degeneration worked on each other and acted together on the landscape. The combined effect epidemic environment which was due to deteriorating drainage condition and agriculture decadence following economic degeneration and merge supply of silt would be a diminution in density of population or an increasing effort on the part of man to establish his mastery over nature. The study aimed at a correlation between growth and decay of

[23] Sen, Jyotirmoy: Land Utilisation and Population Distribution: A Case Study of West Bengal (1850-1985), Daya Publishing House, 1988, pp 1-204.

population and land use at different period and to show the periods of supremacy of physical environment and the supremacy of technology over the physical environment.

**Objectives:**

In order to understand the relationship between population pressure and land use pattern, the following objectives have been set for the present study.

(1) To examine the spatial pattern of land use in India and temporal changes therein.

(2) To examine the spatial pattern of population pressure in India and temporal changes therein during.

(3) To examine the nature and direction of interrelationship between population pressure and land use pattern.

**Sources of Data:**

1. Census of India, 1971, Pt.I.A, General Population Table.
2. Census of India, 1981, Pt.I.A, General population table.
3. Census of India, 1991, Pt.I.A, General population table.
4. Census of India, 2001, Paper I, Provisional population table.
5. Indian Agriculture Statistics, Vol.I, 1969-70 and 1970-71, Directorate of Economics and Statistics, Ministry of Food, & Agriculture. Government of India.
6. Indian Agriculture Statistics, Vol.I, 1979-80 and 1980-81, Directorate of Economics and Statistics, Ministry of Food, & Agriculture. Government of India.

6. Indian Agriculture Statistics, Vol. I, 1989-90 and 1990-91, Directorate of Economics and Statistics, Ministry of Food, & Agriculture. Government of India.

7. Land use Statistics at a glance, 1998-99. , Directorate of Economics and Statistics, Ministry of Food & Agriculture. Government of India.

8. Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1971.

9. Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1981.

10. Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1991.

11. Census of India, 2001, Paper III, Provisional population table.

**Methodology:**

The methodology includes tabulation analysis of data and depiction through suitable cartographic and G.I.S. techniques. The analysis of changes in land use pattern is broadly based on changes in area in various land use classes during study period. Pressure of population on land has been studies by different methods of measures of pressure of population. For making the data comparative, the newly formed states of Utteranchal, Jharkhand and Chhatisgarh have been considered along with their mother states of Utter Pradesh, Bihar and Madhya Pradesh. The coefficient of variation has been worked out to see the interstate variation in pressure of population. To find out the relationship between population pressure and land use pattern, correlation coefficient has been worked out by Pearson method using the following formula.

$$r = \frac{\sum X.Y - \frac{\sum X.\sum Y}{N}}{\sqrt{\sum X^2 - \frac{(\sum X)^2}{N}}\sqrt{\sum Y^2 - \frac{(\sum Y)^2}{N}}}$$

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

Besides this bivariate technique, stepwise linear regression analysis has also been used in cases where it was possible to define independent and dependent variables and where there is more than one independent variable. This particular type of multivariate analysis tells the contribution of every added variable in explaining the dependent variable. This is done by seeing the changing values of $R^2$ in each subsequent step. More importantly it tells us whether the new variable is worth retaining in the model or not.

**Plan of the Study:**

(I) The first chapter introduction includes Statement of the problem, Theoretical background, Review of literatures, Period of study, Objective, Database, Methodology, and Plan of study.

(II) The second chapter deals with the analysis of changing pattern of land use.

(III) The third chapter deals with growing pressure of population on land.

(IV) Chapter third is the study of interrelationship between population and land use.

(V) Chapter fourth includes conclusion of the study.

# Land Use Pattern

## Chapter Two

# CHAPTER 2

## LAND USE PATTERN

### Introduction

Land use study carries a great importance because it can provide a picture about the intensively used, under used and unused lands of the country. Land use changes with time to meet the variable demands on the land by the society in its new ways and conditions of life. The demand of new uses of land may be inspired by a technological change or by a change in size, composition and requirement of a community. In a situation where land is limited resource for crop production, stringent and competing demands arising out of the ecological needs, food and fodder requirement, industrial raw-materials etc. would pool the resource use in a ad hoc- manner keeping up pace with troughs and peaks of the price fluctuation in the community market (Dahiya[1], 1988). Thus the study on changes in land use is very necessary.

In the forthcoming section the changes that occurred under various land use categories has been analyzed. The analysis is broadly based on changes in area in various land use classes. Due to some changes in the methodology of reporting of land use pattern during the late fifties, reformation of boundaries of several states, and the technological revolution of late sixties causing major changes in agricultural land use in some states, the period from 1970-71 to 1998-99 (latest statistics available of land use pattern) is taken for the study.

### Changes in Land Use Pattern:

For the purpose, area under various land uses, their percentages share in the total reported

[1] Dahiya, I.S., soil geography of Haryana. Publication Division, Haryana Agricultural University, Hissar (Haryana)

area and changes therein during three decades are presented in table 2.1 for all India and from table 2.2 to 2.12 for state level. The changes occurred in land use pattern in the study period has been discussed category wise by different headings.

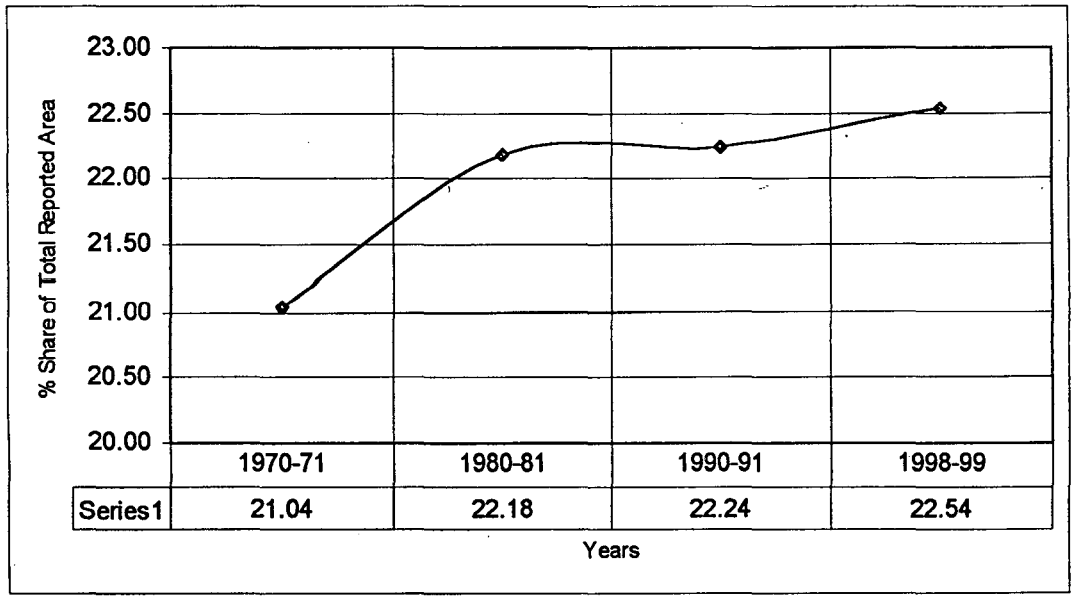
**At all India Level:**

**Forest:**

Land under forest is 68973 thousand hectares accounting 22.54 percent of total reported area at the national level (1998-99), which is 10.97 percent below the norms set in the national forest policy (1952) envisaging one-third of the geographical area should be under forest cover.

It is revealed from the Table (2.1) that area under forest in India has increased marginally from 63917 thousand hectare (21.04 percent of total reported area) in 1970-71 to 68973 thousand hectares (22.54 percent of the total reported area) in 1998-99. Thus, only 1.50 percent increase in forest cover has been reported during three decades figure (2.1).

**Figure 2.1: Changes in Forest Cover (1970-71 to 1998-99)**



## Table: 1.1: Land Use Pattern in India 1950-51 to 1998-99

Area in Thousand Hectares

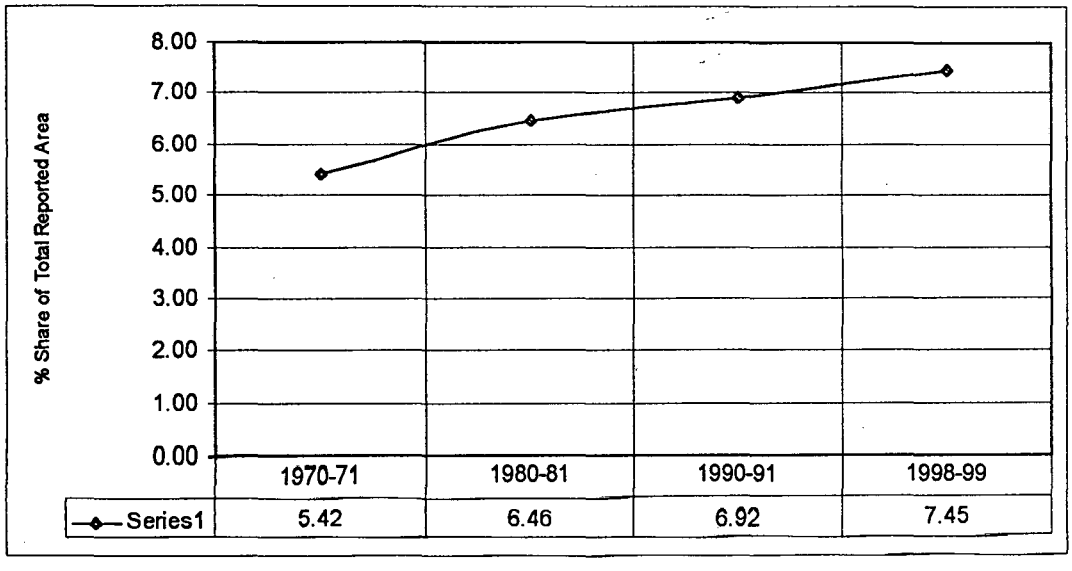
| Classification | 1970-71 | 1980-81 | 1990-91 | 1995-96 | 1998-99 | Ab. Ch.* (1950-51 to 98-99) | % Change (1950-51 to 98-99) | C. G. R.** (1950-51 to 1998-99) |
|---|---|---|---|---|---|---|---|---|
| 1) Reporting area | 303758 | 304159 | 304862 | 304875 | 306044 | 2286 | | |
| i) Forest | 63917<br>21.04 | 67473<br>22.18 | 67805<br>22.24 | 68817<br>22.57 | 68973<br>22.54 | 5056 | 7.91 | 0.27 |
| ii) Not available for cultivation (a+b) | 44639<br>14.70 | 39618<br>13.03 | 40476<br>13.28 | 41371<br>13.57 | 42356<br>13.84 | -2283 | -5.11 | -0.19 |
| a) Non – agriculture uses | 16478<br>5.42 | 19656<br>6.46 | 21087<br>6.92 | 22362<br>7.33 | 22802<br>7.45 | 6324 | 38.38 | 1.17 |
| b) Barren and un- cultivable | 28161<br>9.27 | 19962<br>6.56 | 19389<br>6.36 | 19009<br>6.24 | 19554<br>6.39 | -8607 | -30.56 | -1.29 |
| iii) Other uncultivable land (excluding fallow land) | 35060<br>11.54 | 32328<br>10.63 | 30217<br>9.91 | 28643<br>9.39 | 28669<br>9.37 | -6391 | -18.23 | -0.72 |
| a) Permanent pasture and other grazing land | 13261<br>4.37 | 11974<br>3.94 | 11404<br>3.74 | 11064<br>3.63 | 11104<br>3.63 | -2157 | -16.27 | -0.63 |
| b) Miscellaneous tree crops and groves | 4299<br>1.42 | 3610<br>1.19 | 3812<br>1.25 | 3481<br>1.14 | 3598<br>1.18 | -701 | -16.31 | -0.63 |
| c) Cultivable wasteland | 17500<br>5.76 | 16744<br>5.51 | 14995<br>4.92 | 14098<br>4.62 | 13967<br>4.56 | -3533 | -20.19 | -0.80 |
| iv) Fallow land (a+b) | 19875<br>6.54 | 24748<br>8.14 | 23365<br>7.66 | 23847<br>7.82 | 23445<br>7.66 | 3570 | 17.96 | 0.59 |
| a) Fallow land and other than current fallows | 8759<br>2.88 | 9916<br>3.26 | 9662<br>3.17 | 10016<br>3.29 | 9913<br>3.24 | 1154 | 13.18 | 0.44 |
| b) Current fallows | 11116<br>3.66 | 14832<br>4.88 | 13703<br>4.49 | 13831<br>4.54 | 13532<br>4.42 | 2416 | 21.73 | 0.70 |
| v) Net sown area | 140267<br>46.18 | 140002<br>46.03 | 142999<br>46.91 | 142197<br>46.64 | 142600<br>46.59 | 2333 | 1.66 | 0.06 |
| vii) Area sown more than once as % of N.S.A. | 25524<br>15.40 | 32628<br>18.90 | 42743<br>23.01 | 45274<br>24.15 | 50019<br>30.76 | 24495 | 95.97 | 2.43 |
| vi) Gross cropped area | 165791 | 172630 | 185742 | 187471 | 162619 | -3172 | -1.91 | -0.07 |

* Absolute Change in Thousand Hectares
** Compound Growth Rate
Source: Agriculture Statistics India, 1998-99, Ministry Of Agriculture

**Area put to non-agricultural uses:**

According to table 2.1, the category of non-agriculture uses of land aggregates about 7.5 percent of the total reported area at all India level (1998-99). It had continuously increased from 16478 thousand hectare in 1970-71 to 22802 thousand hectare in 1998-99. In percentage terms its share to total reported area in 1950-51 was 5.42 percent increased up to 7.45 percent in 1998-99 with 1.87 percent compound growth rate annually and the trend presents that it is likely to increase further in future fig (2.2).

**Figure 2.2: Changes in Area under Non Agricultural Uses (1970-71 to 1998-99)**



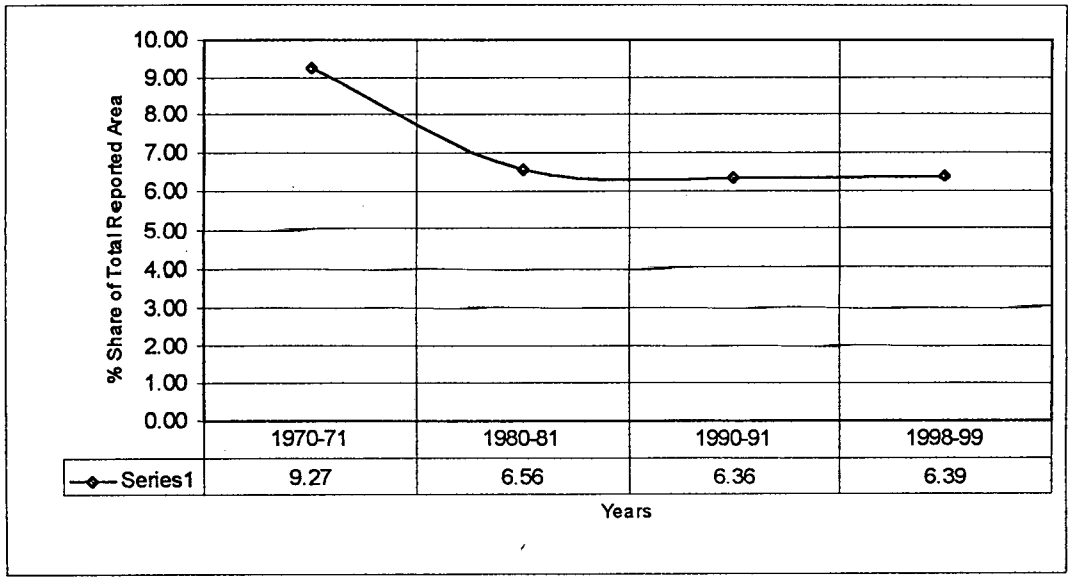

**Barren and uncultivable land:**

Barren and uncultivable land area is generally unsuitable for agricultural uses either because of the topography or because of their instability.

This category is showing a sharp decline in the share of total reported area from 1970-71 to 1980-81 and then it decreased marginally in the following decades. In 1970-71, Barren and Uncultivable land was 28161 thousand hectare, constituting 9.27 percent of the total reported area declined sharply up to 19962 thousand hectare with share 6.36

percent of the total reported area in 1980-81. Overall negative compound growth rate is 1.13 percent annually during the study period (table 2.1 and figure 2.3).

**Figure 2.3: Changes in Barren and Uncultivable Land (1970-71 to 1998-99)**






**Permanent pasture and other grazing land:**

This category forms 4.37 percent of the total reported area in 1970-71 decline marginally to 3.63 percent of the total reported area in 1998-99 (figure, 2.4). Annual compound rate of growth is computed 1.07 percent annually during 48 years.

**Miscellaneous tree crops and groups:**

Miscellaneous tree crops and groves showing a declining tends from decade to decade. It account 1.42 percent share of total reporting area in 1970-71 declined up to 1.18 percent of total reported area in !998-99 (table 2.1 and fig. 2.5

**Figure 2.4: Changes in Permanent Pasture and Grazing Land (1970-71 to 1998-99)**

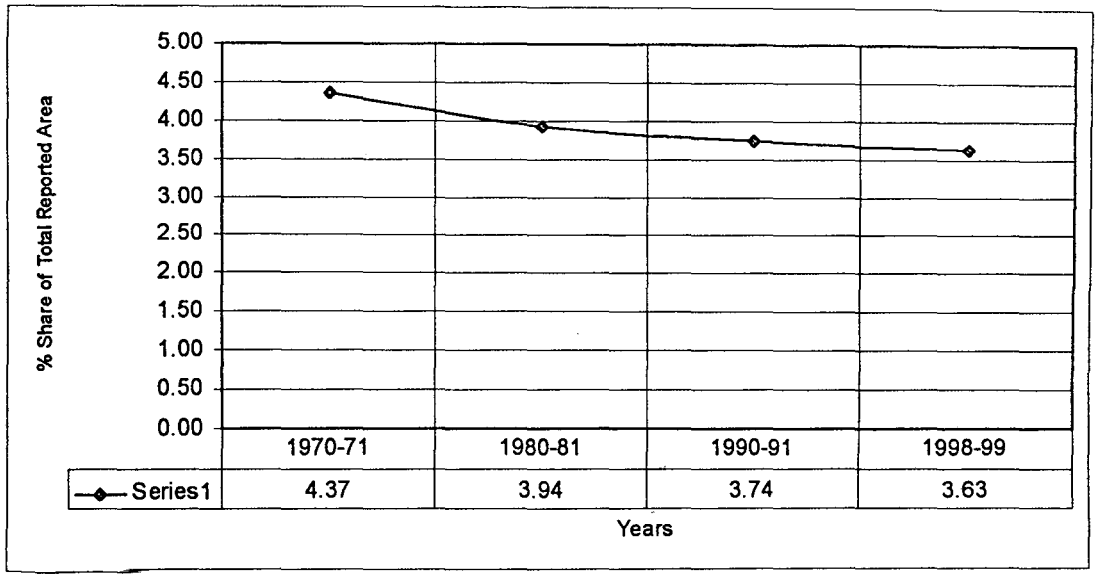
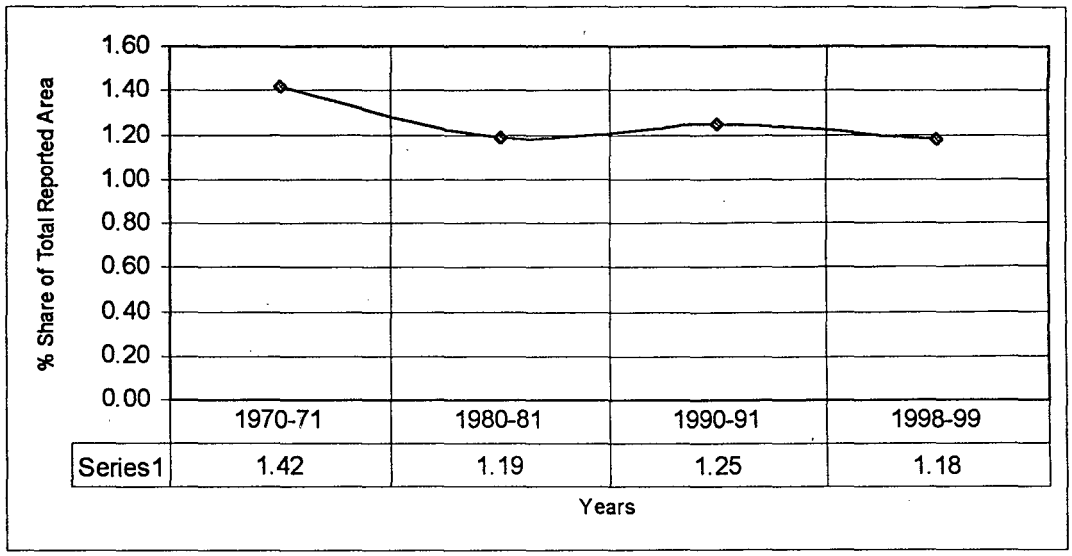



**Fig 2.5: Changes in Land under Miscellaneous Tree Crops and Groves (1970-71 to 1998-99)**



## Under-Utilisation of lands:

The lands under culturable waste, other than current fallow and current fallow are called as under-utilised as these lands are potentially cultivable though not under cultivation for one year or more in succession. By definition current fallow is the one left fallow during the current reporting year, other than current fallow are the land left fallow for the past one to five years and culturable waste for the past over five years in succession. The fallacy of limited scope for further utilisation of land (extension of crop area) has hitherto shadowed the importance of under-utilised agricultural land the scant attention it received (and continues to receive) belies its magnitude and role in Indian agriculture (Reddy[2] 1991). Culturable wasteland, Other than current Fallow and Current fallow has been discussed in details in following section.

**Area under Culturable wasteland:**

The area under wasteland has consistently decreased from 17500 thousand hectares in 1970-71 to 13967 thousand hectares in 1998-99. There share in the total reported has in fact declined from 5.76 percent in 1970-71 to 4.56 percent in 1998-99.This sector shows 1.13 percent negative growth rate annually in the land area during 48 years (figure 2.6).

**Area Under fallow land other than current fallow:**

Area under fallow land other than current fallow has declined from 8759 thousand hectares (2.88 percent of total reported area) in 1970-71 to 9913 thousand hectares (3.24 percent to total reported area) in 1998-99 with ups and downs from decade to

[2] Reddy, V. Ratna (1991), "Under Utilisation of Land in Andhra Pradesh: Extent and Determinants", Indian Journal of Agricultural Economics, Vol. 40, No. 7, October-December.

decade. Compound growth rate of the land in this category registered 1.17 percent annually during the study period (table 2.1 and figure 2.7).

**Figure 2.6: Changes in Cultivable Waste (1970-71 to 1998-99)**

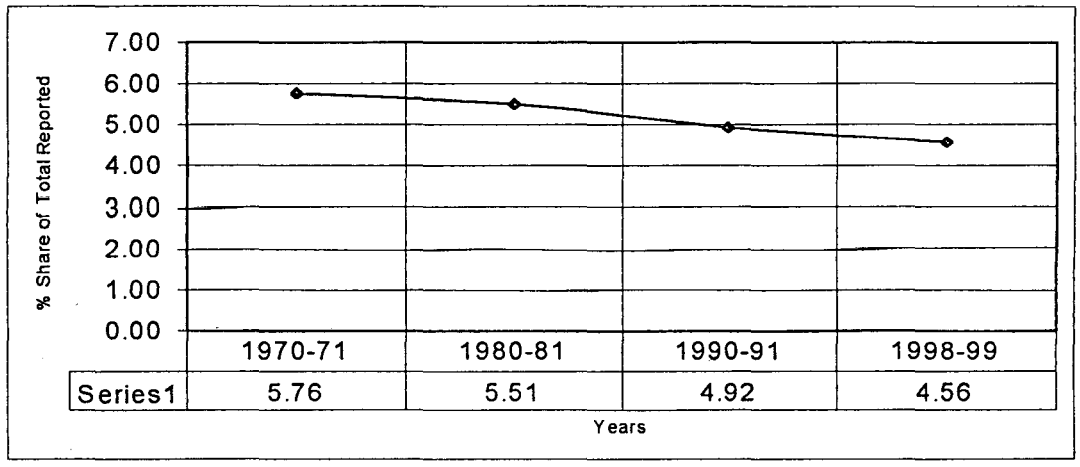
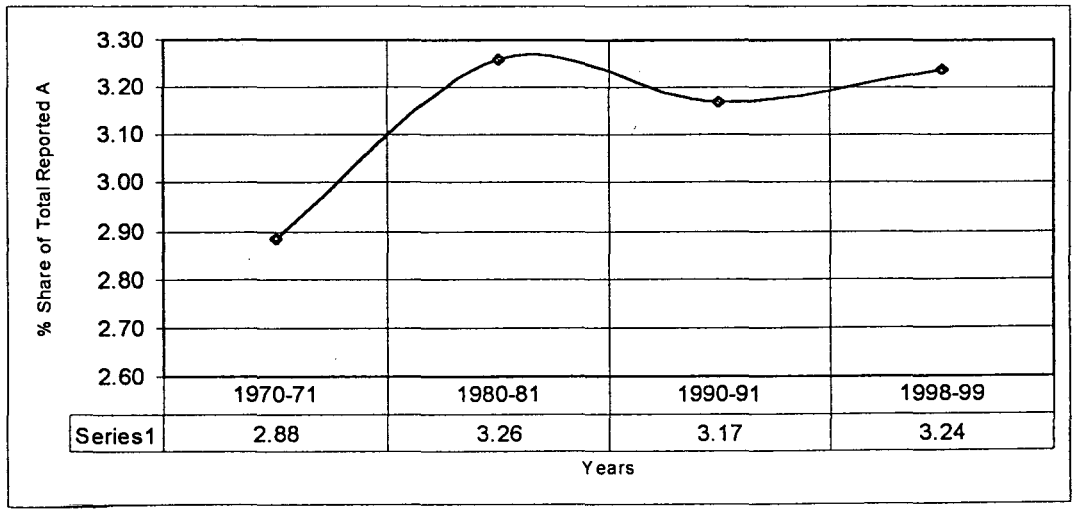



**Figure: 2.7: Changes in Area under Fallow land Other Than Current Fallows (1970-71 to 1998-99)**

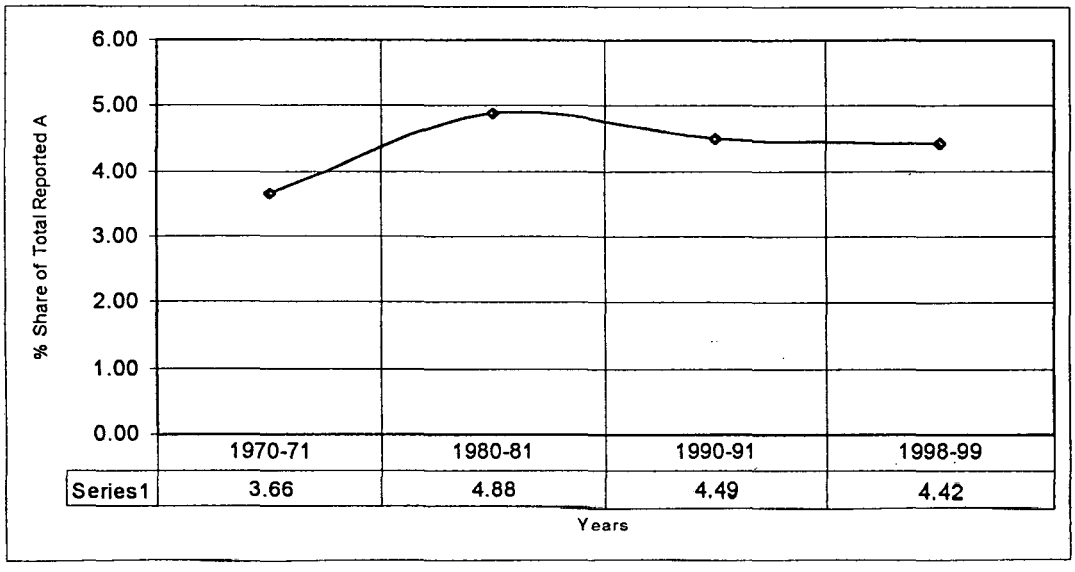



**Current fallow:**

Similarly to other fallow Current fallow land is also showing an uneven increasing trend. The share of this category in total reported area in 1970-71 was 3.66 percent has increased up to 4.42 percent in 1998-99, (figure 2.8). This may be claimed here

that more and more intensification of culturable land is leading to decline in soil fertility and more lands have to be left without cultivation to regain its fertility.

**Figure 2.8: Changes in land under Current Fallow (1970-71 to 1998-99)**

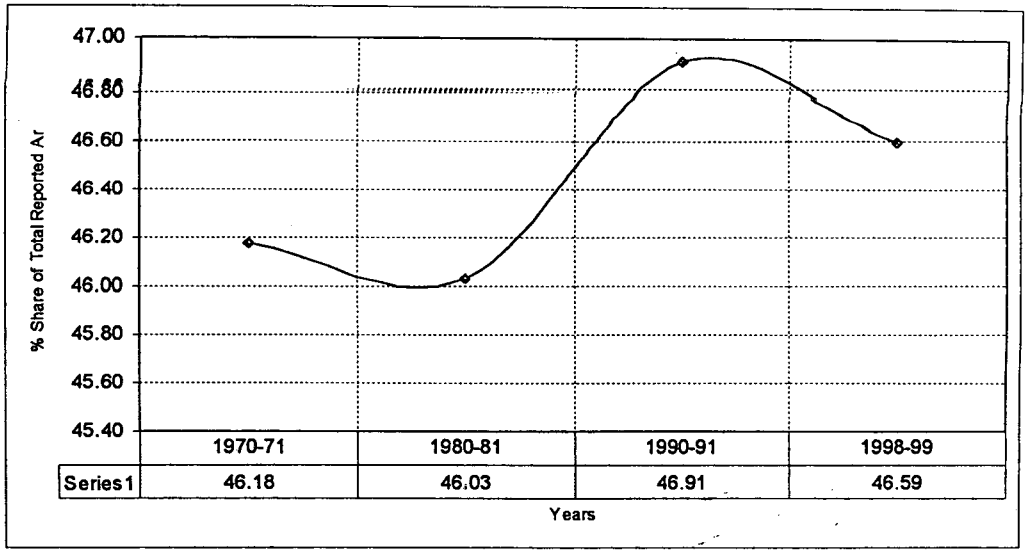



**Changes in net are sown (Expansion of cultivated area):**

Net are sown accounts for the largest share of 46.59% of the total reported area (1998-99). The percentage share of the total reported area in 1970-71 was 140267 (46.18 percent of total reported area) increased marginally to 142600 (46.59 percent to total reported area) in 1998-99, (table 2.1 and figure 2.9). V. K. Pandey and S. K. Tiwari [3] (1996) observed that in fact by the end of sixties the country had already crossed the limit to extension of net sown area.

[3] Pandey, V.K and S.K. Tiwari (1996), "Regional Agricultural Land Use- A Sectoral Aggregate View", Indian journal of Agricultural Economics, Vol. 51, No

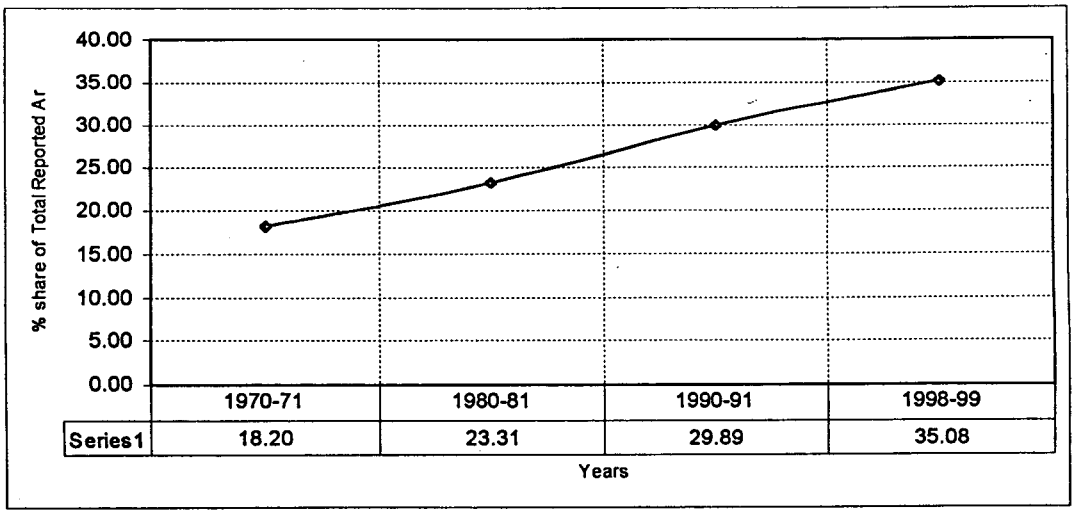
**Figure: 2.9: Changes in Net Area Sown (1970-71 to 1998-99)**




**Area sown more than once (Intensification of cultivation):**

One of the most common indicators of measuring intensity of cropping is the percentage share of multiple cropped area in net cultivated area. It is found that the share has increased constantly from 15.40 percent in 1970-71 to 30.76 percent in 1998-99, figure (2.10).

**Figure 2.10: Changes in Area Sown More Than Once (1970-71 to 1998-99)**



**State Level Analysis:**

**Forest:**

According to the table 2.2 and Fig.2.11 and 2.12, it can be observed easily that most of the states of hilly terrain are prosperous in forest cover. For Instance Arunachal Pradesh, Mizoram, Jammu & Kashmir, Tripura, Nagaland, Meghalaya have more than 60 percent area under forest cover. Thicker growth of natural vegetation in these states is attributed to the existing conditions of hot-wet climate and predominance of rough terrains that are least accessible for human exploitation. Orissa (36% of total reported area), and Madhya Pradesh (33.16% of total reported area) are the two states close to the national norm, with one-third of their reporting area under forests and fulfill the norms of forest cover required for ecological balance set in national forest policy 1952. Among the states, Haryana, Punjab, Rajasthan and Gujarat have extremely low land under forest cover at about 10 percent or less of their reporting area (table 2.2). Part of these states constitute a contiguous north-western desert line which, if not protected by forest cover, would extend its frontiers, the evidences of which are quite visible in parts of Haryana and Gujarat. The other states fall between two.

Table 2.2 reveals that the states Orissa, Madhya Pradesh, Kerala, Uttar Pradesh, Bihar, Tamil Nadu, Karnataka, West Bengal, Gujarat, Rajasthan, Punjab and Haryana recorded increase in area under forest cover during the study period. Normally, with the process of development we find decline in the forest cover. But in the case of these states (a marginal increase in forest covers).This is difficult to explain in precise terms; however, tentatively it may be attributed to successful implementation of government programmes of afforestation. On the other hand few some states of Assam, Andhra

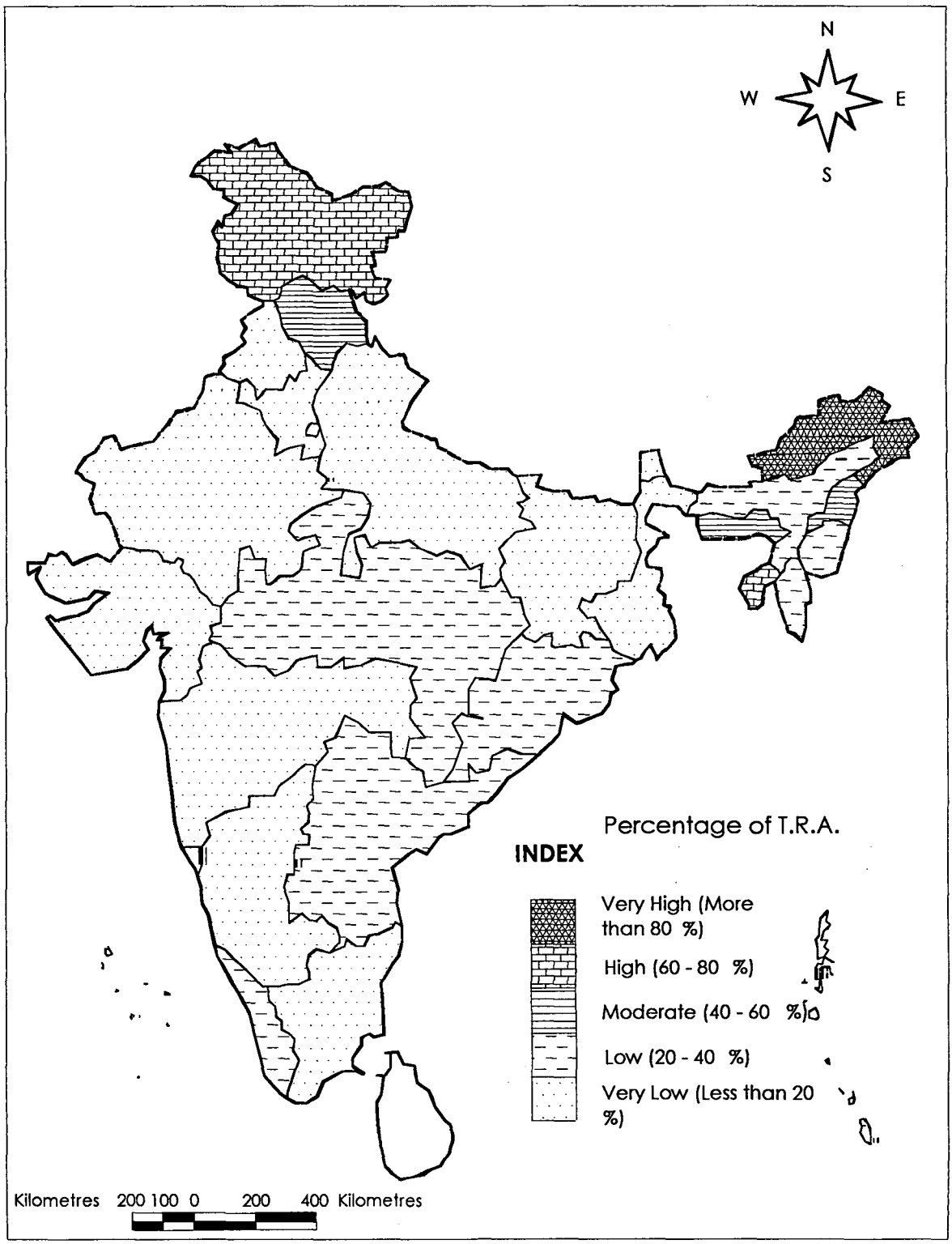
Pradesh and Maharashtra reported decrease in the area forest cover. The states of Punjab and Rajasthan, which have very less area under forest cover, are showing very significant increase. They occupied 2.44 percent and 3.97 percent area to the total reported area respectively under this category in 1970-71 increased continuously to 6.06 percent and 7.46 percent in 1998-99. Gujarat, West Bengal, Karnataka, Tamil Nadu reported marginal increase in their area under forest cover. The percentage share to the total reported area under this category was 8.80, 12.44, 15.26 and 15.48 percent in 1970-71 increased to 13.77, 8.27, 5.99, and 6.31 percent respectively of total reported area in 1998-99.

**Land Put to Non-Agricultural Uses:**

It is evident from table 2.3 that the proportion of land under non-agricultural uses is very high in two highly urbanized and industrialized states of West Bengal, Tamil Nadu. The percentage shares of total reported area under this category of these states are 18.86 percent, 15.14 percent of total reported area in 1998-99. The share in states of Bihar, Assam, Goa, Assam, Tripura and Sikkim range between 10 to 15 percent of the total reported area. All the other states have less than 10 percent of area as non-agricultural uses.

All the states in general recorded steady increase in area put to non-agricultural uses. The states of Maharashtra, Gujarat, and Bihar reported substantial increase during the last three decades. In 1971 the above states had a percentage share of 2.81, 3.98, and 8.91 of the total reported area respectively which increased to 4.03, 6.06, and 14.01 respectively in 1998-99, (Table 2.3 and Figure 2.13 and 2.14).

# Fig. 2.11
# FOREST LAND (1970-71)



# FIG. 2.12
# FOREST LAND (1998-99)

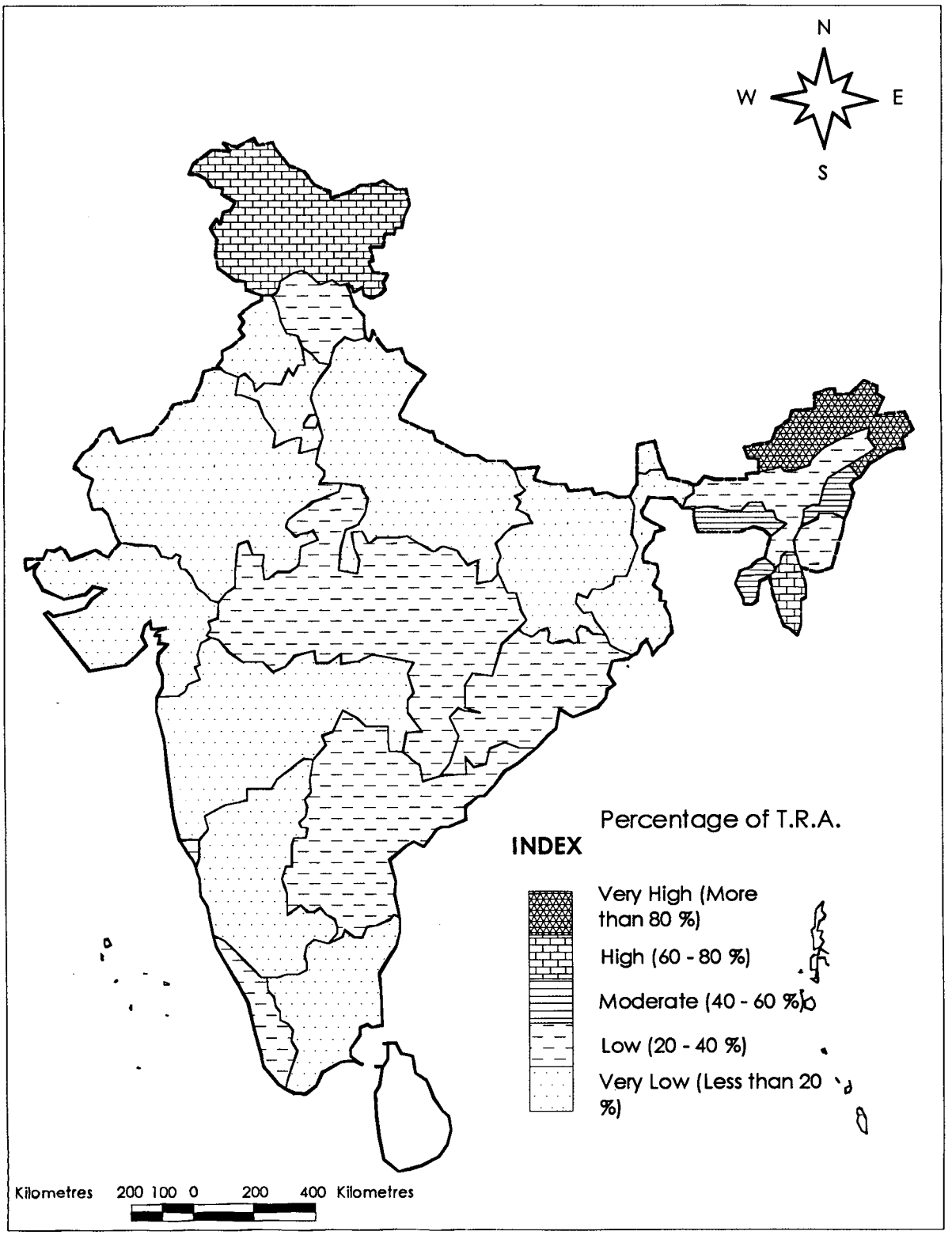


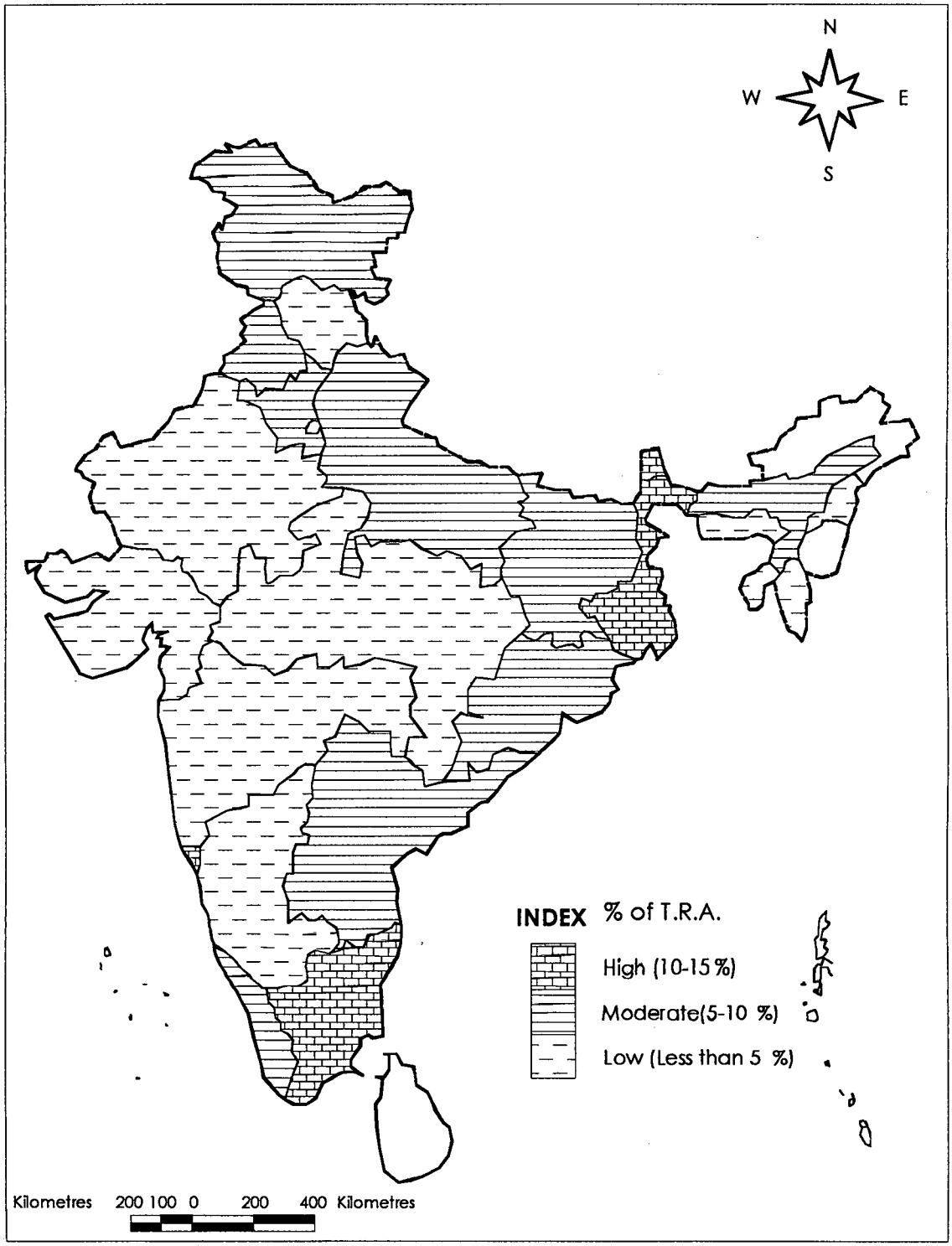
Table 2.2: Changes in Forest Cover (1970-71 to 1998-99)

Percentage of Total Reported Area

| States | 1971 | 1981 | 1991 | 1998 |
|---|---|---|---|---|
| Andhra Pradesh | 23.09 | 22.64 | 22.84 | 22.59 |
| Arunachal Pradesh | 91.32 | 92.86 | 93.80 | 93.79 |
| Assam | 26.64 | 25.28 | 25.27 | 24.59 |
| Bihar | 16.90 | 16.31 | 17.02 | 17.02 |
| Goa | - | - | 29.09 | 34.63 |
| Gujarat | 8.82 | 10.45 | 10.01 | 9.88 |
| Haryana | 2.25 | 3.00 | 3.88 | 2.62 |
| Himachal Pradesh | 54.86 | 27.04 | 30.85 | 23.77 |
| Jammu& Kashmir | 61.38 | 62.44 | 60.98 | 60.98 |
| Karnataka | 15.26 | 15.92 | 16.14 | 16.08 |
| Kerala | 27.34 | 27.82 | 27.82 | 27.85 |
| Madhya Pradesh | 32.68 | 31.77 | 32.31 | 33.16 |
| Maharashtra | 17.46 | 17.26 | 17.39 | 17.45 |
| Manipur | 27.23 | 27.23 | 27.23 | 27.23 |
| Meghalaya | 8.23 | 36.10 | 41.94 | 41.59 |
| Mizoram | - | - | 61.99 | 75.77 |
| Nagaland | 19.69 | 26.64 | 56.27 | 56.09 |
| Orissa | 32.00 | 42.73 | 35.24 | 36.00 |
| Punjab | 2.44 | 4.37 | 4.41 | 6.06 |
| Rajasthan | 3.97 | 6.10 | 6.87 | 7.46 |
| Sikkim | - | 36.44 | 36.20 | 36.20 |
| Tamil Nadu | 15.48 | 15.56 | 16.55 | 16.46 |
| Tripura | 60.11 | 55.15 | 57.77 | 57.77 |
| Uttar Pradesh | 16.62 | 17.25 | 17.33 | 17.50 |
| West Bengal | 12.44 | 13.38 | 12.33 | 13.72 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

## FIG. 2.13
## INDIA: LAND PUT TO NON-AGRICULTURAL USES (1970-71)



# FIG. 2.14
# INDIA: LAND PUT TO NON-AGRICULTURAL USES (1998-99)

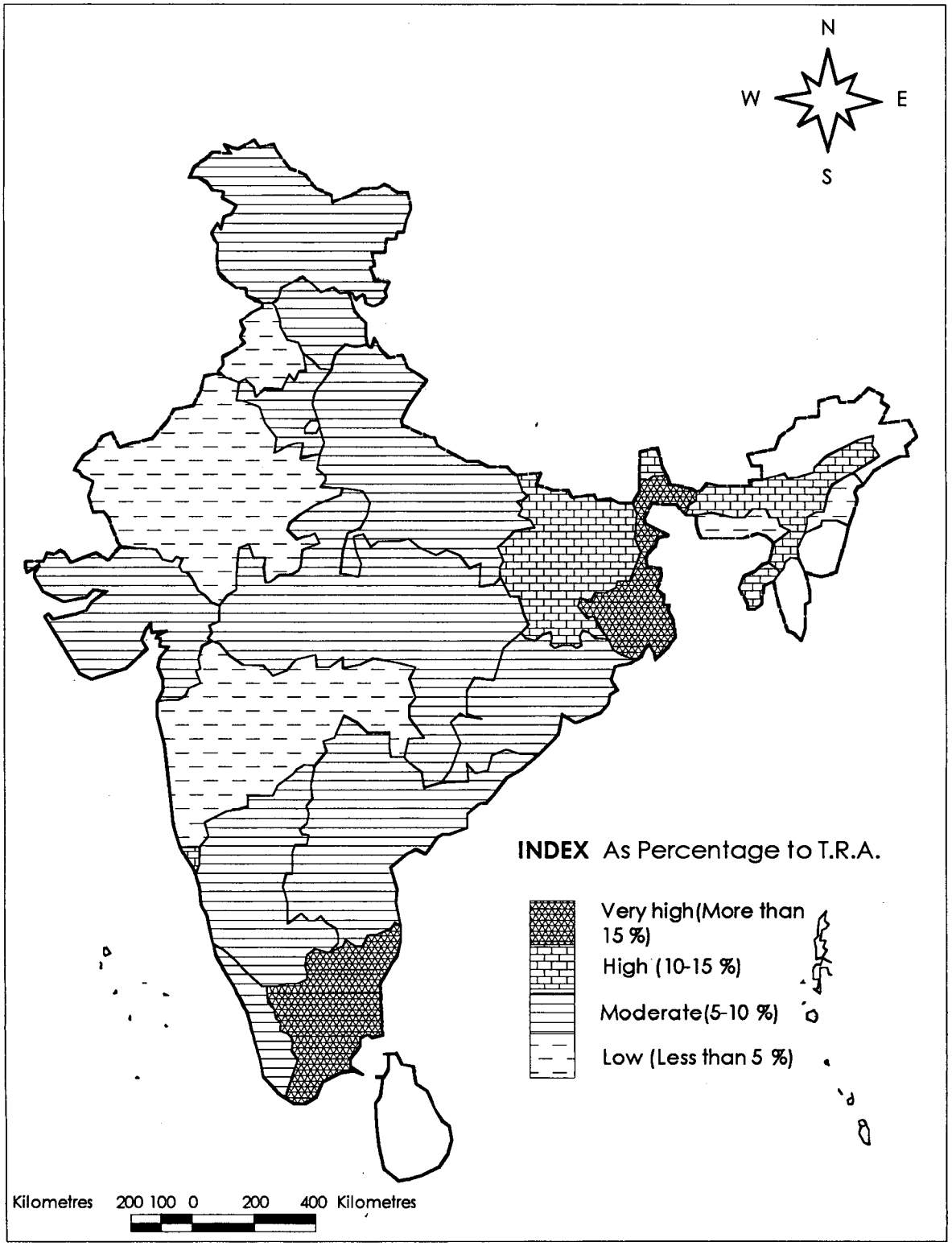


Table 2.3: Area under Non Agricultural Uses

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 7.73 | 7.90 | 8.41 | 9.45 |
| Arunachal Pradesh | - | - | - | - |
| Assam | 9.84 | 11.61 | 11.64 | 13.39 |
| Bihar | 8.92 | 9.91 | 12.17 | 14.01 |
| Gujarat | 3.38 | 5.67 | 5.93 | 6.06 |
| Goa | - | - | 5.54 | 10.25 |
| Haryana | 7.02 | 8.35 | 7.31 | 7.97 |
| Himachal Pradesh | 3.56 | 5.43 | 5.73 | 5.27 |
| Jammu &Kashmir | 6.32 | 7.14 | 6.46 | 6.46 |
| Karnataka | 4.95 | 5.60 | 6.24 | 6.80 |
| Kerala | 7.10 | 6.95 | 7.64 | 8.60 |
| Madhya Pradesh | 4.69 | 5.04 | 5.37 | 5.68 |
| Maharashtra | 2.24 | 3.23 | 3.75 | 4.03 |
| Manipur | 1.18 | 1.22 | 1.22 | 1.18 |
| Meghalaya | - | 3.78 | 3.75 | 3.79 |
| Mizoram | - | - | - | - |
| Nagaland | - | 4.72 | 1.83 | 4.17 |
| Orissa | 6.44 | 4.07 | 4.80 | 5.38 |
| Punjab | 8.26 | 8.56 | 6.82 | - |
| Rajasthan | 3.40 | 4.40 | 4.35 | 4.98 |
| Sikkim | - | 6.82 | 13.66 | 13.66 |
| Tamil Nadu | 11.44 | 13.44 | 13.98 | 15.14 |
| Tripura | 4.29 | 11.45 | 12.58 | 12.68 |
| Uttar Pradesh | 6.82 | 7.67 | 8.13 | 8.58 |
| West Bengal | - | 14.62 | 18.42 | 18.86 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

There is ample evidence and generally accepted fact that the states of Maharashtra and Gujarat have been experiencing higher share of India's industrialization and consequent urbanization coupled with increase in physical infrastructure. Therefore, the increase of area under the non-agricultural uses hardly needs any more explanation. As far as other states including Bihar is concerned, the trend of increase can be attributed to the population growth in general and consequent social change in respect of family size specially tendency towards single family. More the division of families more the requirement of land for housing purposes.

**Barren & Uncultivable Land:**

West Bengal and Orissa have very low percentage of share under this category i.e. less than 1 percent of total reported area. It is quite evident that these are the states with high population density and any surplus land has been taken under cultivation to feed the ever-growing population. While Manipur, Sikkim, Himachal Pradesh, Assam and Gujarat have very high i.e. 64.18, 24.34, 20.08, 18.59, and 13.84 percent of total reported area respectively. Among these, Manipur, Sikkim, and Himachal Pradesh have rugged topography due to which the percentages are high. In Gujarat a substantial portion is under 'Rann of Kuchch'. Other remaining states lie between 1 to 8 percent (table 2.4).

Almost all the states reported decline in the share under Barren and Uncultivable land except a few states viz. Jammu & Kashmir, Andhra Pradesh, and Manipur which are more or less stable. It means that the barren land is being encroached for other than agricultural purposes. Among all states Kerala, Haryana, and Rajasthan reported the highest reduction. These three states had 1.87, 4.11, and 13.83 percent of land under this

Fig: 2.15 Changes in Barren and Uncultivable Land (1970-71 to 1998-99)

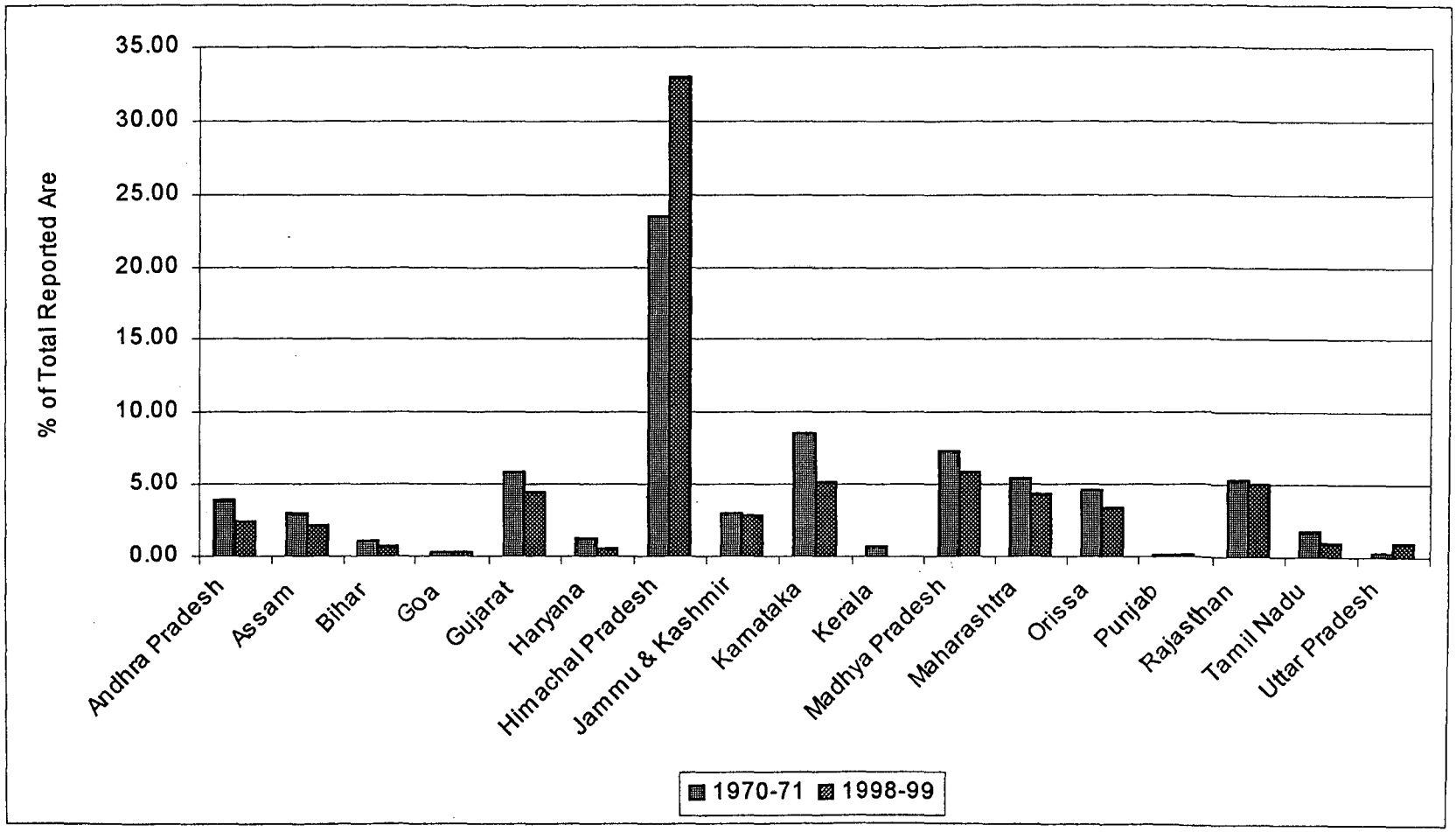


Table 2.4 Changes in Barren & Unculturable land

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 7.66 | 8.53 | 7.64 | 7.68 |
| Arunachal Pradesh | - | - | 0.87 | 0.87 |
| Assam | 23.08 | 19.63 | 19.63s | 18.59 |
| Bihar | 6.12 | 5.83 | 5.86 | 5.83 |
| Gujarat | 22.66 | 13.30 | 13.86 | 13.84 |
| Goa | - | | 3.60 | - |
| Haryana | 4.11 | 1.48 | 2.22 | 2.03 |
| Himachal Pradesh | 2.30 | 4.72 | 5.46 | 20.08 |
| Jammu &Kashmir | 5.39 | 4.94 | 6.57 | 6.46 |
| Karnataka | 4.43 | 4.43 | 4.19 | 4.19 |
| Kerala | 1.87 | 2.21 | 1.52 | 0.72 |
| Madhya Pradesh | 5.25 | 5.25 | 4.69 | 3.83 |
| Maharashtra | 5.77 | 5.63 | 5.46 | 5.53 |
| Manipur | 62.42 | 64.13 | 64.18 | 64.18 |
| Meghalaya | 84.74 | 10.23 | 6.34 | 6.25 |
| Mizoram | - | - | 9.56 | 3.08 |
| Nagaland | 72.91 | - | - | - |
| Orissa | 5.16 | 1.71 | 3.21 | 3.97 |
| Punjab | 4.13 | 1.95 | 1.65 | 6.70 |
| Rajasthan | 13.83 | 8.52 | 8.15 | 7.60 |
| Sikkim | - | 28.51 | 24.37 | 24.37 |
| Tamil Nadu | 6.40 | 4.44 | 3.91 | 3.68 |
| Tripura | 0.57 | - | - | - |
| Uttar Pradesh | 4.76 | 3.84 | 3.47 | 3.12 |
| West Bengal | 14.37 | 1.37 | 2.11 | 0.35 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

category respectively in 1970-71 which decreased to 0.72, 2.03, and 7.60 percent respectively in 1998-99. This decrease can be attributed to many development factors like, green revolution (mainly irrigation facility) which enabled barren land to be taken under cultivation in case of Haryana and Rajasthan. Andhra Pradesh, Karnataka, Maharashtra, and Bihar have registered no significant change during study period (fig 2.15).

**Permanent Pasture & Grazing Land:**

Among all the states Himachal Pradesh has been found to have extremely high percentage with the share of 32.95 percent of the total reported area. Madhya Pradesh, Karnataka and Rajasthan are the four states reporting more than 5 percent of land under this category (table 2.5).

All the states except Uttar Pradesh and Himachal Pradesh reported decline in the share under this category. Kerala have sown very significant decline, which had .73 percent of land under pasture and grazing land in 1970-71 reported decrease to .03 percent in 1998-99. Similarly some other states of Haryana, Tamil Nadu, Bihar, Karnataka and Andhra Pradesh have reported significant decrease of land under this category during study period (2.5).

**Miscellaneous Tree Crops & Groves:**

This category belongs to horticulture, orchards, and plantation. Nagaland, Meghalaya, Orissa and Assam and Tripura are the four states, which have more than 2 percent share of total reported area under this category. Other remaining states have less than 1 percent of land under this category (table 2.6).

Fig: 2.16 Changes in Permanent Pasture and Grazing Land (1970-71 to 1998-99)

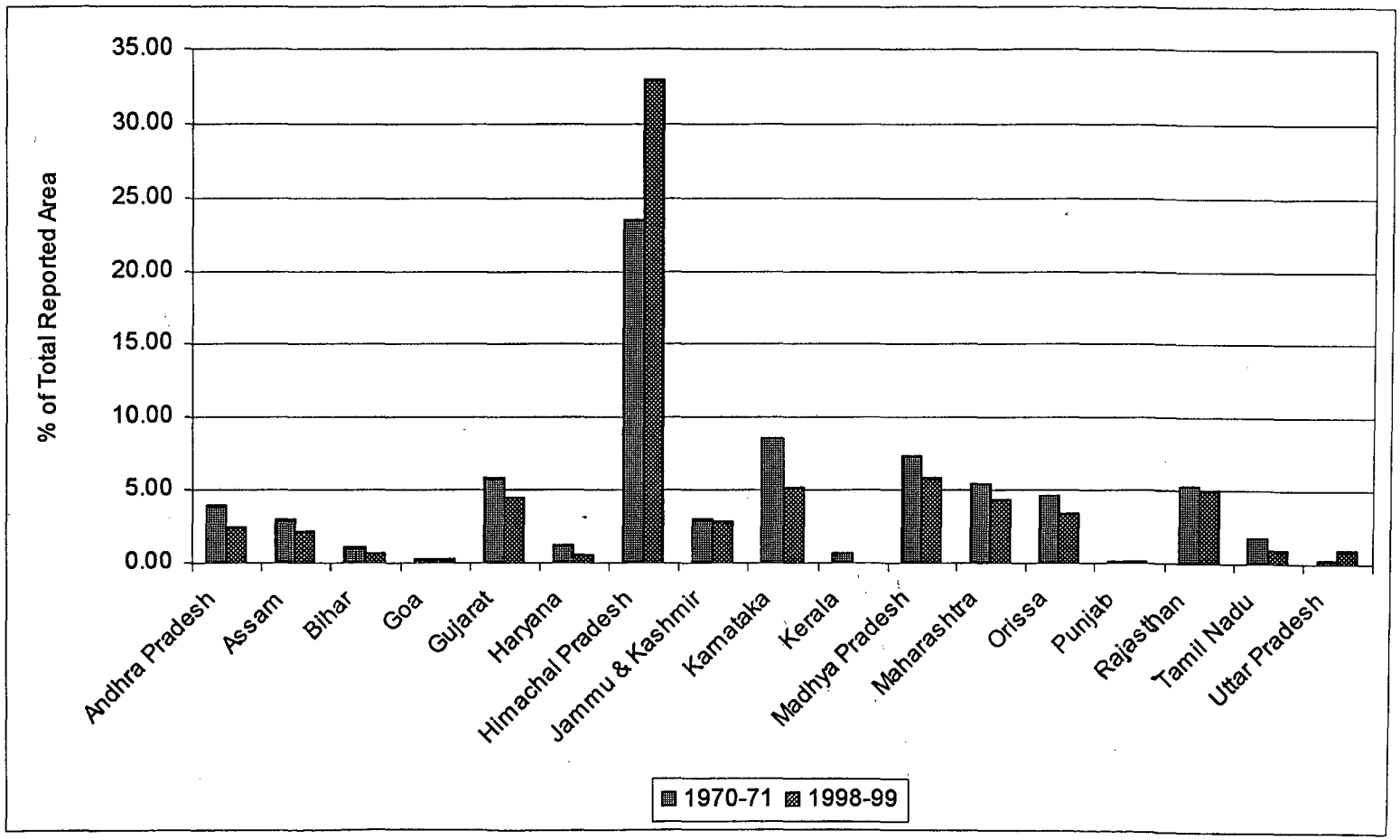


Table 2.5 Permanent Pastures and Other Grazing Land

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 3.93 | 3.38 | 3.07 | 2.50 |
| Arunachal Pradesh | - | - | - | - |
| Assam | 3.00 | 2.36 | 2.34 | 2.13 |
| Bihar | 1.04 | 0.83 | 0.73 | 0.61 |
| Goa | 0.27 | 0.27 | 0.28 | 0.28 |
| Gujarat | 5.88 | 4.51 | 4.51 | 4.51 |
| Haryana | 1.23 | 0.66 | 0.53 | 0.55 |
| Himachal Pradesh | 23.40 | 33.03 | 33.73 | 32.95 |
| Jammu &Kashmir | 2.94 | 2.65 | 2.82 | 2.80 |
| Karnataka | 8.55 | 7.07 | 5.76 | 5.18 |
| Kerala | 0.73 | 0.13 | 0.05 | 0.03 |
| Madhya Pradesh | 7.28 | 6.41 | 6.17 | 5.79 |
| Maharashtra | 5.42 | 5.17 | 4.94 | 4.36 |
| Manipur | - | - | - | - |
| Meghalaya | - | 0.76 | - | 0.00 |
| Mizoram | - | 0.19 | 0.19 | 0.00 |
| Nagaland | - | - | - | 0.00 |
| Orissa | 4.67 | 3.60 | 4.67 | 3.41 |
| Punjab | 0.10 | 0.08 | 0.20 | 0.08 |
| Rajasthan | 5.30 | 5.36 | 5.58 | 5.01 |
| Tamil Nadu | 1.78 | 14.19 | 0.95 | 0.95 |
| Tripura | 3.24 | - | - | - |
| Uttar Pradesh | 0.26 | 1.00 | 1.02 | 0.99 |
| West Bengal | - | 0.05 | 0.08 | 0.08 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

The most profound change has been seen in the states of Arunachal Pradesh, Himachal Pradesh, Orissa, Bihar, Haryana and Rajasthan. Their share ware .34, .27, .81, 2.77, 1.14, .07 and .03 in 1970-71 increased significantly to .80, .54, 1.57, 4.97, 1.98, 0.11 and 0.04 percent in 1998-99 respectively (table 2.6 and figure 1.).

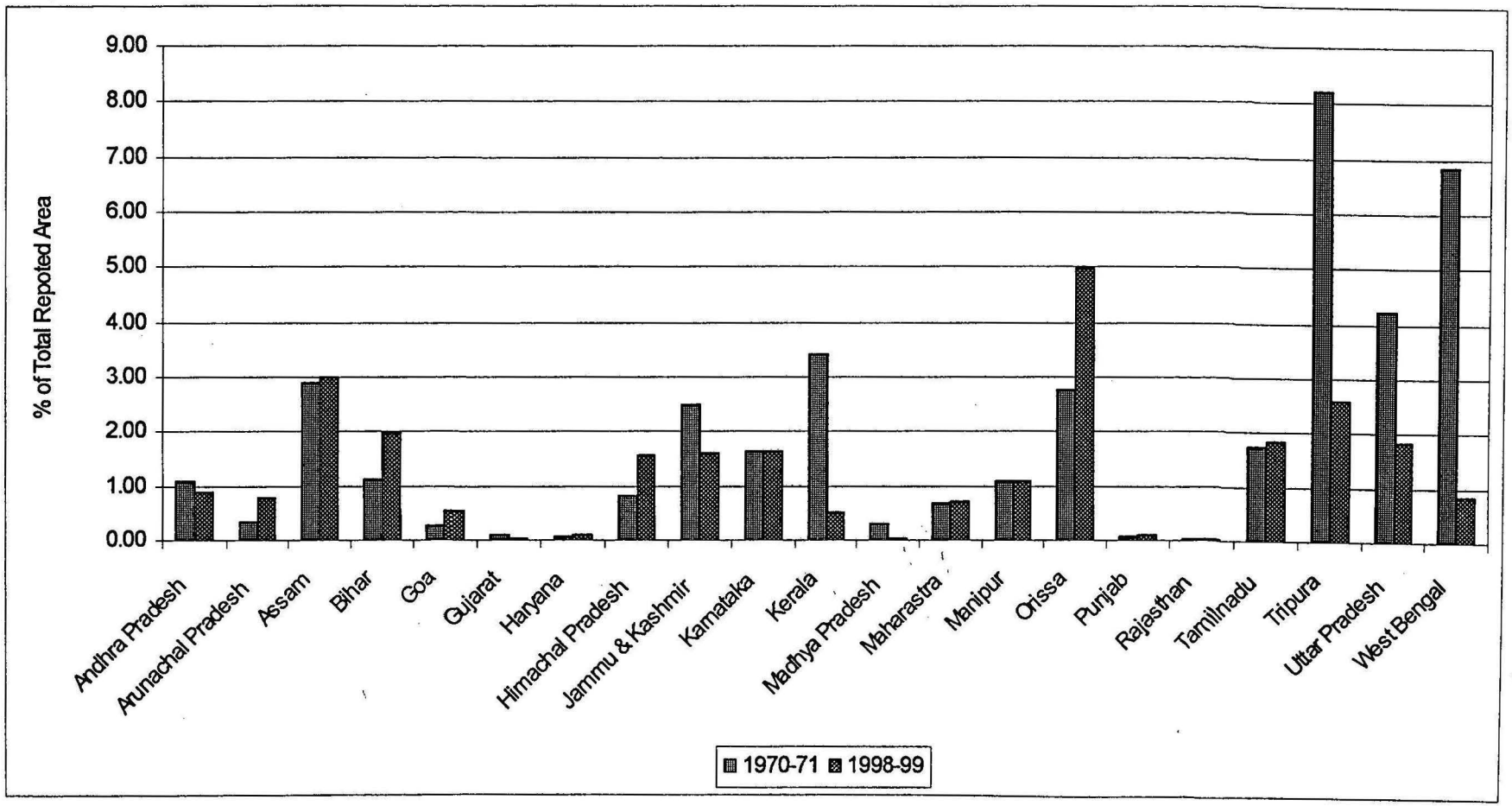
**Table 2.6: Land under Miscellaneous Tree Crops and Groves**

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 1.08 | 0.95 | 0.95 | 0.88 |
| Arunachal Pradesh | 0.34 | 0.90 | 0.79 | 0.80 |
| Assam | 2.90 | 3.25 | 3.15 | 3.01 |
| Bihar | 1.14 | 1.22 | 1.68 | 1.98 |
| Goa | 0.27 | 0.27 | 0.54 | 0.54 |
| Gujarat | 0.11 | 0.02 | 0.02 | 0.02 |
| Haryana | 0.07 | - | 0.07 | 0.11 |
| Himachal Pradesh | 0.81 | 1.31 | 1.43 | 1.57 |
| Jammu &Kashmir | 2.48 | 2.20 | 1.62 | 1.60 |
| Karnataka | 1.64 | 1.80 | 0.09 | 1.64 |
| Kerala | 3.42 | 1.65 | 0.88 | 0.51 |
| Madhya Pradesh | 0.30 | 0.36 | 0.23 | 0.04 |
| Maharashtra | 0.67 | 0.60 | 0.59 | 0.72 |
| Manipur | 1.09 | 1.09 | 1.09 | 1.09 |
| Meghalaya | - | 6.45 | 6.83 | 7.05 |
| Mizoram | - | 0.14 | 0.14 | 0.00 |
| Nagaland | - | 4.16 | 8.16 | 7.95 |
| Orissa | 2.77 | 2.72 | 5.53 | 4.97 |
| Punjab | 0.08 | 0.06 | 0.24 | 0.10 |
| Rajasthan | 0.03 | 0.07 | 0.06 | 0.04 |
| Tamil Nadu | 1.74 | 1.64 | 1.80 | 1.85 |
| Tripura | 8.21 | 9.35 | 3.72 | 2.57 |
| Uttar Pradesh | 4.23 | 2.15 | 1.83 | 1.84 |
| West Bengal | 6.86 | 1.83 | 0.52 | 0.84 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

Fig: 2.17 Changes in Miscellaneous Tree Crops and Groves (1970-71 to 1998-99)



**Culturable Waste Land:**

Unscientific method of cultivation and other similar farm practices may make earlier cultivated area abandoned due to unsuitability of the same on account of soil deficiencies.

The states of Meghalaya, Mizoram, Rajasthan and Gujarat have more than 10 percent of land of the total reported area under culturable wasteland, while at the other hand Haryana, Punjab and West Bengal has very less percentage of land(less than 1 percent) under this category (table 2.7).

The decrease is observed in all states except Gujarat in culturable wasteland, which conversely showed positive growth. Punjab and Assam reported very significant decline in this category. These states accounted 1.69 and 2.36 percent land under this category in 1970-71 decreased up to .73 and 1.02 percent in 1998-99.

**Other than Current Fallows:**

The states of Haryana, Punjab, Gujarat, West Bengal, Jammu and Kashmir, Himachal Pradesh, Andhra Pradesh, Kerala, Tripura and Arunachal Pradesh have less than 1 percent, It is observed that most of the states with high rural population density and having intensified cropping pattern have a little share of land as other than current fallow of the total reported area. On the other hand, some states namely Tamil Nadu Andhra Pradesh, Bihar, Meghalaya and Mizoram reported very high share (5 to 8 percent) of their reporting area lying fallow land other than current fallows.

Gujarat, Assam, Karnataka and Madhya Pradesh have sown negative growth in the case of other than current fallow land. The three states of Madhya Pradesh, Rajasthan and Bihar have registered no significant change in land under other than current fallow. On the other hand Orissa, Tamil Nadu, Andhra Pradesh, Maharashtra and Uttar Pradesh have shown positive growth (table 2.8 and figure 1.15).

Fig: 2.18 Changes in Culturable Waste Land (1970-71 to 1998-99)

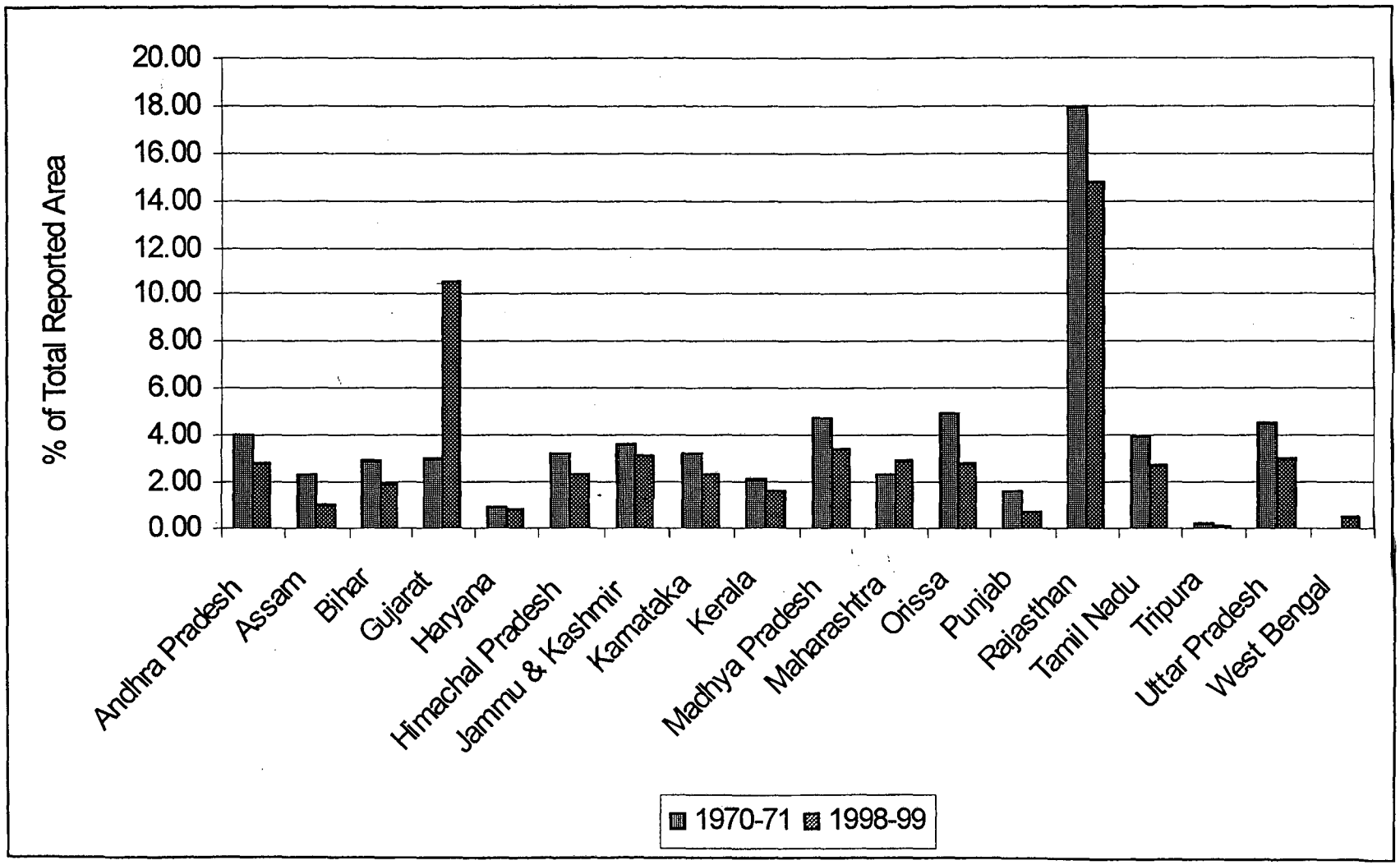


Fig: 2.19: Changes in Other Than Current Fallow (1970-71 to 1998-99)

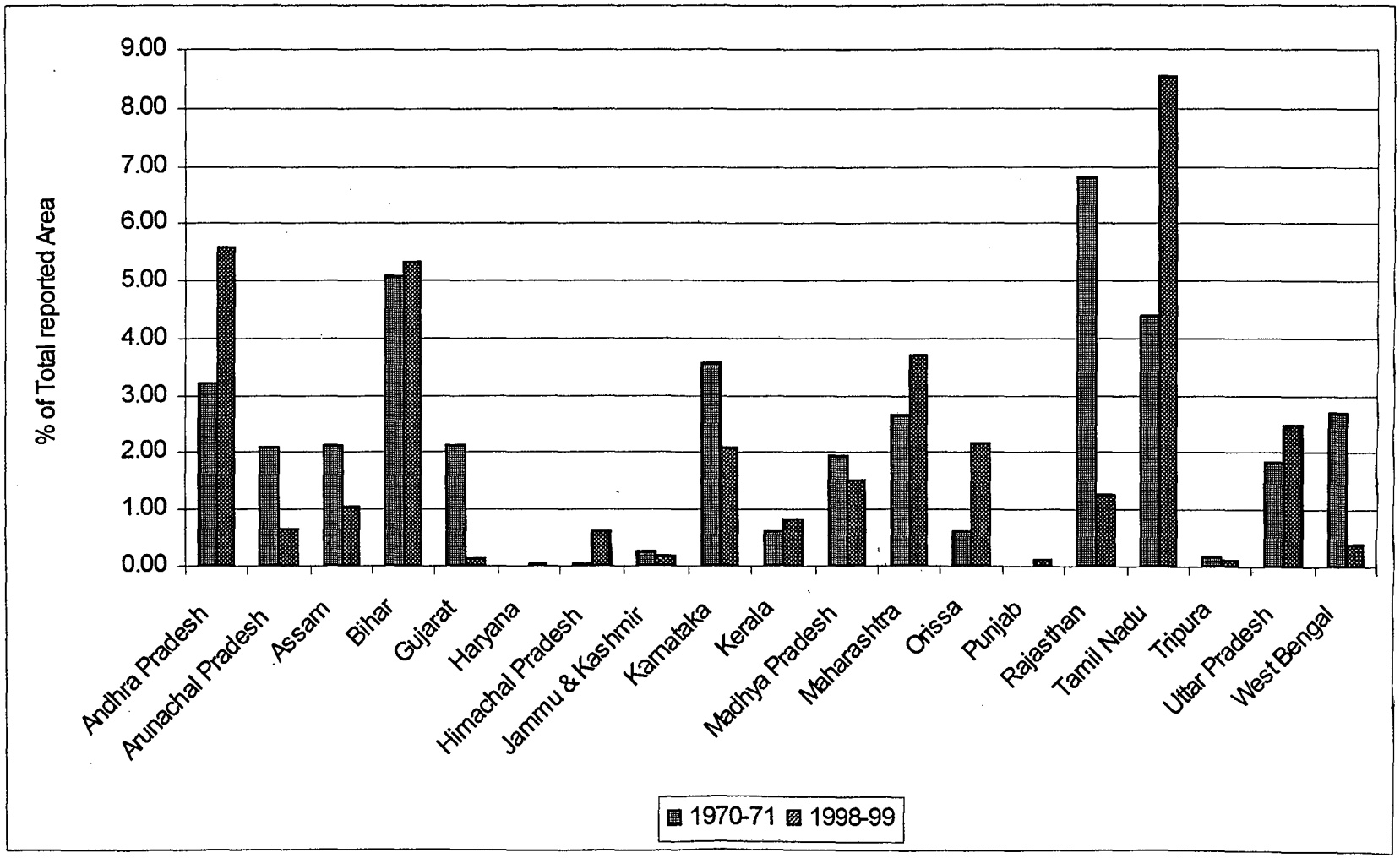


Table 2.7: Culturable Waste Land

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 4.07 | 3.17 | 2.84 | 2.82 |
| Arunachal Pradesh | - | - | - | - |
| Assam | 2.36 | 1.72 | 1.32 | 1.02 |
| Bihar | 2.96 | 2.58 | 2.15 | 1.86 |
| Gujarat | 2.98 | 10.55 | 10.51 | 10.53 |
| Goa | - | - | 24.93 | 15.79 |
| Haryana | 0.93 | 0.70 | 0.48 | 0.84 |
| Himachal Pradesh | 3.17 | 7.50 | 3.71 | 2.36 |
| Jammu &Kashmir | 3.65 | 3.14 | 3.06 | 3.11 |
| Karnataka | 3.25 | 2.64 | 2.34 | 2.28 |
| Kerala | 2.07 | 3.32 | 2.45 | 1.62 |
| Madhya Pradesh | 4.77 | 4.31 | 3.56 | 3.39 |
| Maharashtra | 2.31 | 3.23 | 3.39 | 2.89 |
| Manipur | - | - | - | - |
| Meghalaya | - | 20.23 | 22.02 | 20.97 |
| Meghalaya | | | 3.52 | 8.25 |
| Nagaland | - | 4.53 | 6.46 | 4.17 |
| Orissa | 4.96 | 1.60 | 3.84 | 2.86 |
| Punjab | 1.65 | 0.81 | 0.70 | 0.74 |
| Rajasthan | 17.92 | 18.74 | 16.25 | 14.79 |
| Sikkim | | 1.53 | 0.14 | 0.14 |
| Tamil Nadu | 3.90 | 2.64 | 2.23 | 2.68 |
| Tripura | 0.19 | 0.19 | 0.10 | 0.10 |
| Uttar Pradesh | 4.51 | 3.86 | 3.47 | 3.01 |
| West Bengal | - | 4.23 | 1.20 | 0.52 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

Table 2.8 Fallow Land Other Than Current Fallow

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 3.21 | 4.92 | 5.02 | 5.57 |
| Arunachal Pradesh | 2.09 | 1.89 | 0.88 | 0.66 |
| Assam | 2.13 | 1.39 | 1.07 | 1.04 |
| Bihar | 5.07 | 5.42 | 5.76 | 5.34 |
| Goa | - | - | - | - |
| Gujarat | 2.11 | 1.76 | 0.32 | 0.14 |
| Haryana | - | - | - | 0.05 |
| Himachal Pradesh | 0.04 | 0.44 | 0.45 | 0.62 |
| Jammu & Kashmir | 0.24 | 0.17 | 0.13 | 0.18 |
| Karnataka | 3.55 | 2.93 | 2.40 | 2.10 |
| Kerala | 0.60 | 0.69 | 0.69 | 0.82 |
| Madhya Pradesh | 1.94 | 2.48 | 1.86 | 1.51 |
| Maharashtra | 2.66 | 2.61 | 3.20 | 3.70 |
| Manipur | - | - | - | 0.00 |
| Meghalaya | - | 11.61 | 7.46 | 7.41 |
| Mizoram | - | 12.32 | 12.32 | 7.73 |
| Nagaland | - | 39.04 | 7.18 | 4.94 |
| Orissa | 0.61 | 1.22 | 1.38 | 2.16 |
| Punjab | - | - | 0.56 | 0.10 |
| Rajasthan | 6.82 | - | 1.27 | 1.27 |
| Sikkim | - | 6.10 | 5.63 | 6.67 |
| Tamil Nadu | 4.41 | 3.53 | 8.02 | 8.55 |
| Tripura | 0.19 | 0.19 | 0.10 | 0.10 |
| Uttar Pradesh | 1.83 | 2.41 | 2.97 | 2.49 |
| West Bengal | 2.70 | 0.69 | 0.58 | 0.38 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

**Current Fallows:**

The states of Punjab, Sikkim, Arunachal Pradesh, Tripura, Manipur, and Mizoram have very less amount of land under this category i.e. less than 1 percent of total reported area. Punjab, which is characterized with the highest intensification of cropping and having the highest percentage share under cultivated land among all the states, have the lowest share under this category. The states of north-eastern region of India which, have very less opportunity of land for ploughing, are showing similarly very low percentage share, indicating the maximum utilization of land for crop production. Madhya Pradesh, Kerala and Assam have less than 2 percent land under this category. On the other hand Bihar, Andhra Pradesh, Tamil Nadu, Karnataka and Rajasthan have very high share (6 to 11 percent) of their reporting area under this category. The remaining states have a share of 3 to 4 percent under this category (table 2.9).

Only three states namely Punjab, Orissa, and Gujarat shown negative growth rate of 4.02, 1.82, and1.01 percent annually. The three states of Haryana, Madhya Pradesh and Tamil Nadu have registered no significant change. On the other hand remaining nine states of Kerala, Karnataka, Rajasthan, Maharashtra, Andhra Pradesh, Assam and Uttar Pradesh have sown positive growth in current fallow (table 2.9).

Fig 2.19: Canges in Current Fallows (1970-71 to 1998-99)

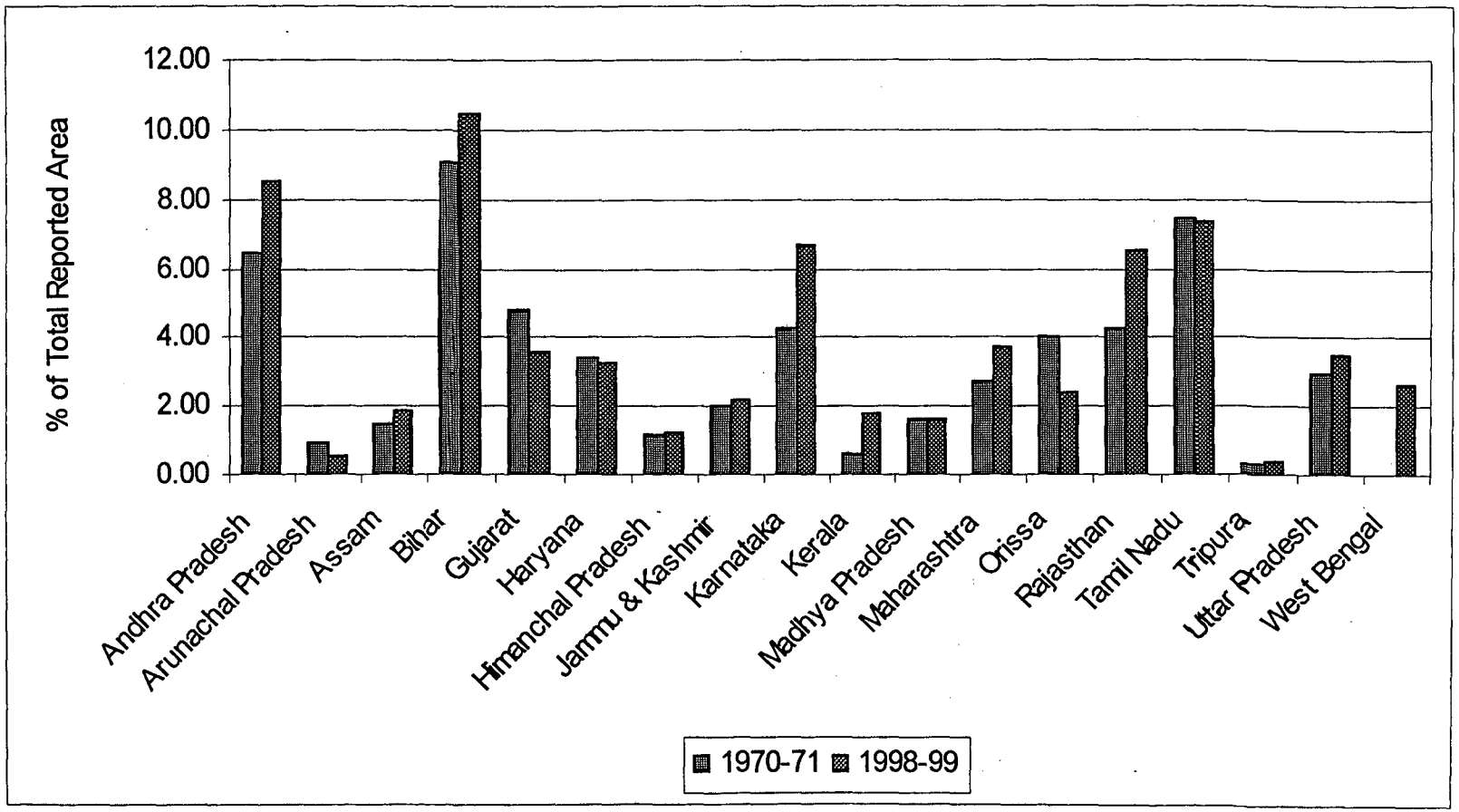


Table 2.9: Current Fallow

Percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 190-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 6.45 | 9.34 | 9.06 | 8.50 |
| Arunachal Pradesh | 0.92 | 0.45 | 0.45 | 0.51 |
| Assam | 1.48 | 1.25 | 0.87 | 1.83 |
| Bihar | 9.08 | 9.92 | 10.18 | 10.47 |
| Goa | - | - | - | - |
| Gujarat | 4.84 | 2.87 | 5.52 | 3.59 |
| Haryana | 3.41 | 4.04 | 3.86 | 3.25 |
| Himachal Pradesh | 1.16 | 1.37 | 1.34 | 1.26 |
| Jammu& Kashmir | 1.99 | 2.01 | 2.15 | 2.15 |
| Karnataka | 4.28 | 7.66 | 6.77 | 6.65 |
| Kerala | 0.60 | 1.11 | 1.13 | 1.75 |
| Madhya Pradesh | 1.62 | 2.09 | 1.72 | 1.65 |
| Maharashtra | 2.68 | 2.77 | 2.83 | 3.68 |
| Manipur | - | - | - | 0.00 |
| Meghalaya | - | 2.27 | 2.64 | 3.08 |
| Mizoram | - | 8.14 | 8.71 | 0.00 |
| Nagaland | - | 7.22 | 7.70 | 5.90 |
| Orissa | 4.01 | 2.91 | 0.77 | 2.39 |
| Punjab | | | | |
| Rajasthan | 4.23 | 6.09 | 5.30 | 6.53 |
| Tamil Nadu | 7.42 | 16.31 | 9.71 | 7.35 |
| Tripura | 0.29 | 0.19 | 0.10 | 0.38 |
| Uttar Pradesh | 2.92 | 3.93 | 3.64 | 3.45 |
| West Bengal | - | 0.93 | 4.47 | 2.64 |

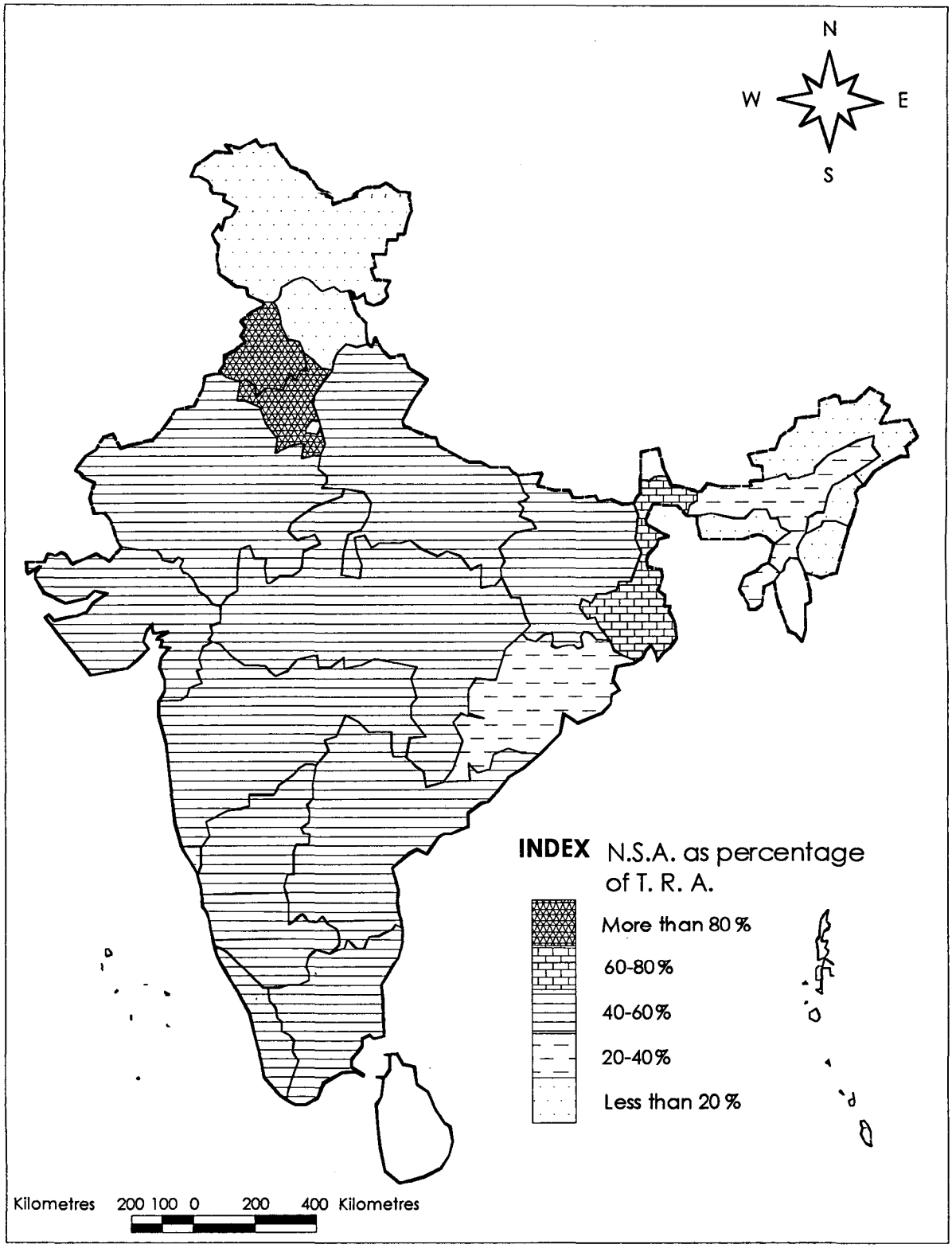
Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

**Net Area Sown:**

The states Punjab and Haryana have an extremely high share of more than 80 percent under the net area sown. West Bengal is another one which occupies the third rank with 63 % of total reported area as net sown area. In the states of Uttar Pradesh, Maharashtra, Kerala, Karnataka, Gujarat, Bihar, Tamil Nadu, Rajasthan, Andhra Pradesh and Madhya Pradesh net area sown varies between 40 to 60 percent. Orissa, Assam and Tripura have net sown area between 20 to 40 percent. The states of Jammu & Kashmir, Himachal Pradesh, Meghalaya, Manipur, Nagaland, and Arunachal Pradesh have very low percentage as net sown area i.e. less than 20 percent of total reported area (table 2.10).

The trend of net area sown in majority of the states is showing very little or no increase except some of the North-Eastern states viz. Nagaland, Arunachal Pradesh, Meghalaya, Assam, and Tripura, which experienced a substantial increase. These states had 4.44, 2.04, 7.25, 28.9, and 22.9 percent respectively, under the net area sown in 1970-71 while these figure increased to 16.73, 3.37, 9.86, 34.41, and 26.41 respectively in 1998-99. The net area sown in India has ceased to increase in general after 1970s, as is evident from the table 1.1. Since, smaller North-Eastern states had traditional very less percentage of net sown area; under recent increasing pressure on land they have shown a rapid increase and they had unlike, bigger agricultural states, the scope too to increase it (fig. 2.20 and 2.21).

# FIG. 2.20 NET AREA SOWN (1970-71)



# FIG. 2.21
# NET AREA SOWN (1998-99)

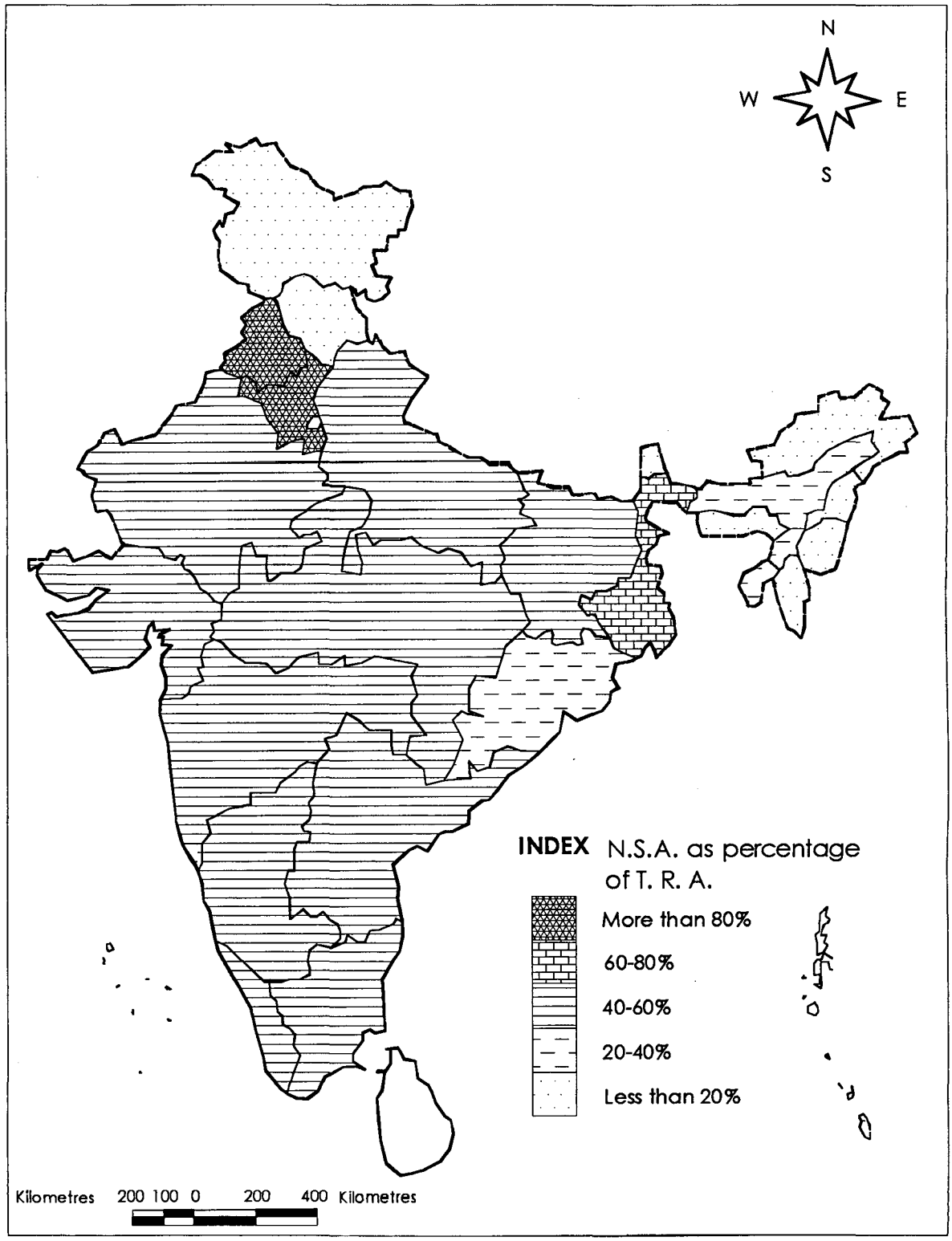


Table 2.10: Changes in Net Area Sown:

As percentage of Total Reported Area

| States | 1970-71 | 1980-81 | 1990-91 | 1998-99 |
|---|---|---|---|---|
| Andhra Pradesh | 42.77 | 39.13 | 40.16 | 40.01 |
| Arunachal Pradesh | 2.04 | 2.02 | 2.69 | 3.37 |
| Assam | 28.51 | 33.81 | 34.46 | 34.41 |
| Bihar | 48.78 | 47.98 | 44.44 | 42.88 |
| Gujarat | 50.87 | 50.88 | 50.32 | 51.42 |
| Goa | - | - | 36.29 | 39.34 |
| Haryana | 80.99 | 81.77 | 81.66 | 82.57 |
| Himachal Pradesh | 10.70 | 19.16 | 17.28 | 12.12 |
| Jammu &Kashmir | 15.61 | 15.29 | 16.23 | 16.27 |
| Karnataka | 54.10 | 51.96 | 54.49 | 55.06 |
| Kerala | 56.28 | 56.11 | 57.84 | 58.15 |
| Madhya Pradesh | 41.48 | 42.30 | 44.11 | 44.73 |
| Maharashtra | 59.53 | 59.49 | 58.53 | 57.65 |
| Manipur | 8.10 | 6.33 | 6.33 | 6.33 |
| Meghalaya | 7.25 | 8.58 | 9.02 | 9.86 |
| Mizoram | - | - | 3.09 | 5.17 |
| Nagaland | 7.40 | 13.69 | 12.40 | 16.73 |
| Orissa | 39.38 | 39.45 | 40.57 | 38.84 |
| Punjab | 80.56 | 83.27 | 83.82 | 84.20 |
| Rajasthan | 44.50 | 44.61 | 47.81 | 46.91 |
| Sikkim | - | 11.96 | 13.38 | 13.38 |
| Tamil Nadu | 47.44 | 41.22 | 42.85 | 43.35 |
| Tripura | 22.90 | 23.47 | 25.74 | 26.41 |
| Uttar Pradesh | 58.06 | 57.91 | 58.06 | 59.02 |
| West Bengal | 62.61 | 62.91 | 60.30 | 62.62 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture.

**Area Sown More Than Once:**

The spatial pattern of distribution of multiple cropped areas, as depicted in table (2.11), reveals a wide range of variation from one state to another in the extent of intensification of ploughing. In fact the intensification of farming depends, to a large extent, on such factors as physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. In the three states of Punjab, Haryana and West Bengal, intensification of cropping is very high i.e. more than 70 percent. Among these Punjab tops the list of all states in India with 91.53 percent of net sown area. This trend in Haryana and Punjab hardly needs explanation as these are the celebrated green revolution states, while, West Bengal owe its intensification to subsistence nature of agriculture better called 'oriental agriculture' where pressure on land is tremendous. People, there cannot afford to have fallow land. While, Meghalaya, Tamil Nadu, Karnataka, Gujarat, Nagaland and Mizoram have very less intensification of cropping i.e. less than 20 percent. The factors mentioned earlier like, physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. are responsible behind the dismal performance in these states. One or more of these factors are constantly keeping the intensity very low.

The changes in area sown more than once indicate that, while most of states have achieved positive growth, the two states of Kerala and Tamil Nadu and Bihar have shown no growth. A majority of states like, Manipur, Nagaland, Maharashtra, Rajasthan, Orissa, Karnataka, Arunachal Pradesh, West Bengal, Punjab, Haryana, and Jammu & Kashmir have shown very significant increase in the cropping intensification.

# FIG. 2.23
# AREA SOWN MORE THAN ONCE (1970-71)

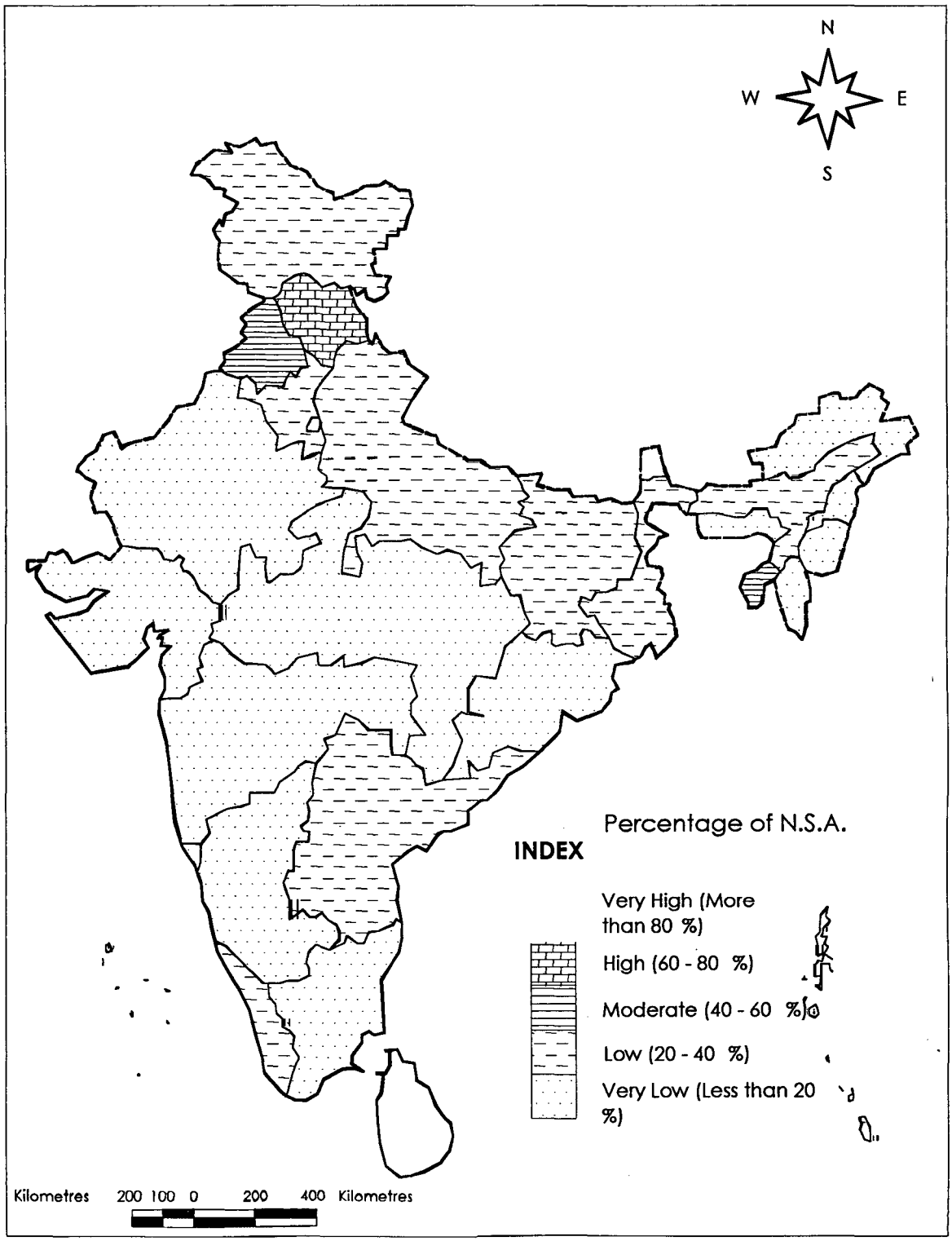


FIG. 2.24

## AREA SOWN MORE THAN ONCE (1998-99)

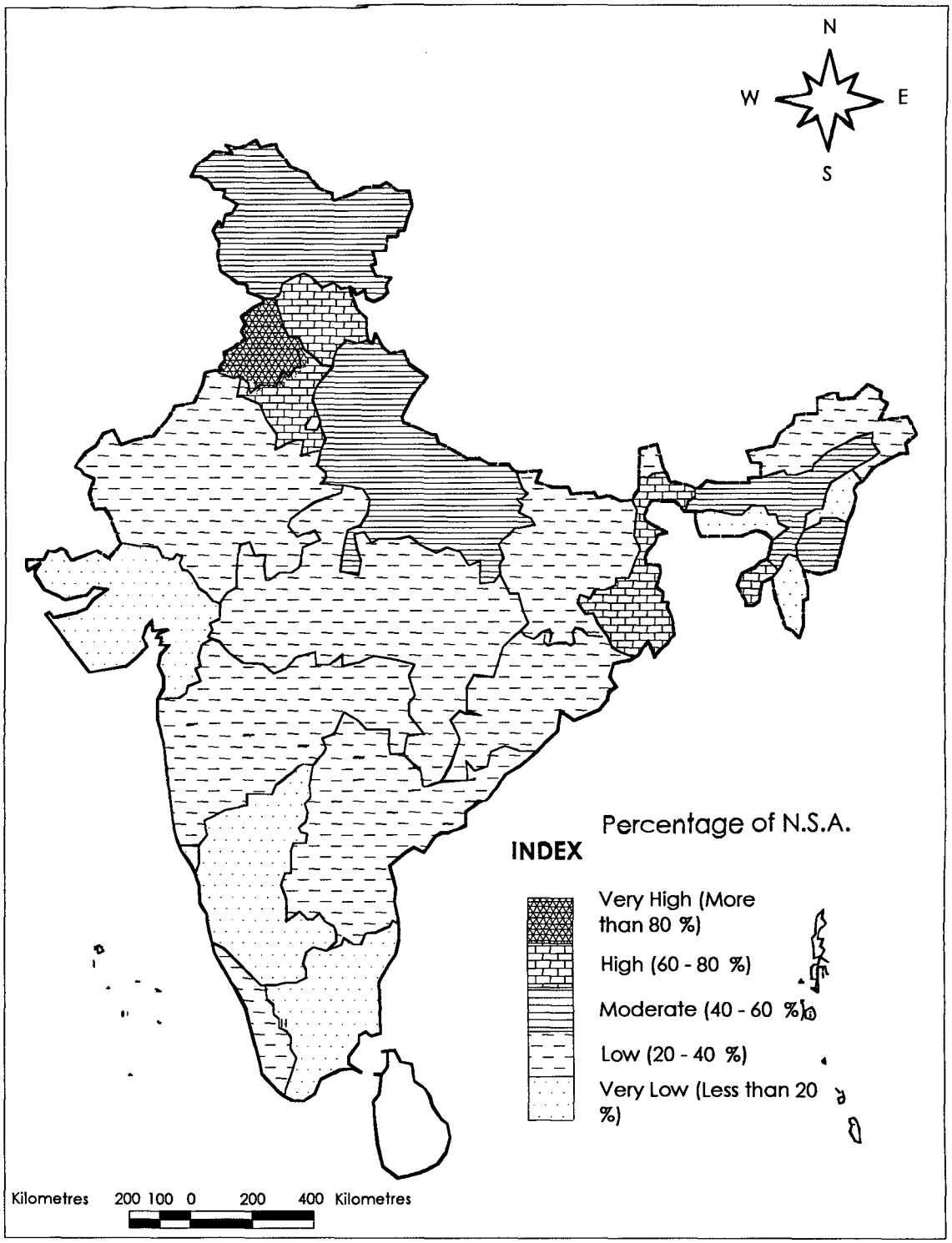


Table 2.11: Area Sown More Than Once

Percentage of Net Area Sown

| States | 1971 | 1981 | 1991 | 1998 |
|---|---|---|---|---|
| Andhra Pradesh | 13.74 | 14.37 | 19.69 | 24.11 |
| Arunachal Pradesh | 13.04 | 25.89 | 65.10 | 35.14 |
| Assam | 24.77 | 29.79 | 40.91 | 45.91 |
| Bihar | 30.42 | 34.07 | 36.13 | 35.28 |
| Goa | - | - | 15.27 | 19.72 |
| Gujarat | 6.55 | 11.69 | 12.79 | 10.63 |
| Haryana | 39.05 | 51.64 | 65.57 | 74.20 |
| Himachal Pradesh | 67.28 | 65.38 | 68.90 | 76.68 |
| Jammu & Kashmir | 22.66 | 36.22 | 45.96 | 47.48 |
| Karnataka | 6.24 | 7.69 | 13.27 | 17.37 |
| Kerala | 35.04 | 31.28 | 34.40 | 29.13 |
| Madhya Pradesh | 12.04 | 14.44 | 22.10 | 31.11 |
| Maharashtra | 6.05 | 10.77 | 12.89 | 24.94 |
| Manipur | 5.00 | 56.43 | 28.57 | 54.29 |
| Meghalaya | 17.79 | 15.54 | 18.81 | 19.91 |
| Mizoram | - | - | 18.46 | 6.42 |
| Nagaland | 1.67 | 6.76 | 10.53 | 9.58 |
| Orissa | 11.91 | 42.68 | 52.19 | 39.30 |
| Punjab | 40.09 | 61.37 | 77.86 | 91.53 |
| Rajasthan | 10.21 | 13.64 | 18.33 | 33.15 |
| Sikkim | - | - | 54.74 | 33.68 |
| Tamil Nadu | 19.70 | 20.69 | 18.87 | 17.62 |
| Tripura | 43.75 | 52.44 | 64.81 | 60.29 |
| Uttar Pradesh | 34.11 | 42.70 | 47.29 | 51.32 |
| West Bengal | 27.29 | 36.93 | 62.39 | 70.75 |

Source: Various issues of Indian Agriculture Statistics (71, 81, 91, 99), Ministry of Agriculture

**Conclusion:**

It can be concluded from the above analysis that at the country level there has been an increase in the area under forest, land under non-agriculture use, permanent pasture and other grazing land, current fallow and net area sown. This has led to a decline in the barren and unculturable land, land under miscellaneous tree crops and groves, culturable wasteland and fallow land. These transformations in the land use pattern were largely in response to increase in urbanisation, industrialization and due to increase in demand for food grains and agricultural raw material. The demand of food can partly met through the extension of area under cultivation and partly through intensification of cropping by increasing multiple cropped area. At the country level both fallow land and other than current fallow has tended to increase in their area, while culturable wasteland has shown still negative growth. Net area sown after 1970-71 remained more or less constant implies that the reclaimed in culturable land has been nullified by an increase in current fallow and other than current fallows.

Most of the states of hilly terrain are prosperous in forest cover. Thicker growth of natural vegetation in these states is attributed to the existing conditions of hot-wet climate and predominance of rough terrains that are least accessible for human exploitation. Orissa and Madhya Pradesh are the two states close to the national norm, with one-third of their reporting area under forests and fulfill the norms of forest cover required for ecological balance set in national forest policy 1952. While at the other hand the states lies within Indo-Gangatic plains whist is amongst the fertile tracts of India have extremely low land under forest cover. The states Orissa, Madhya Pradesh, Kerala, Uttar Pradesh, Bihar, Tamil Nadu, Karnataka, West Bengal, Gujarat, Rajasthan, Punjab and Haryana recorded increase in area under forest cover during the study period. Normally, with the process of development we find decline in the forest cover. This is difficult to explain in precise terms; however, tentatively it may be attributed to successful implementation of government programmes of afforestation.

The proportion of land under non-agricultural uses is very high in two highly urbanized and industrialized states of West Bengal, Tamil Nadu followed by Bihar, Assam, Goa, Assam, Tripura and Sikkim. All the states in general recorded steady

increase in area put to non-agricultural uses but the states of Maharashtra, Gujarat, and Bihar reported substantial increase during the last three decades. There is ample evidence and generally accepted fact that the states of Maharashtra and Gujarat have been experiencing higher share of India's industrialization and consequent urbanization coupled with increase in physical infrastructure. Therefore, the increase of area under the non-agricultural uses hardly needs any more explanation. As far as other states including Bihar is concerned, the trend of increase can be attributed to the population growth in general and consequent social change in respect of family size specially tendency towards single family. More the division of families more the requirement of land for housing purposes.

It is found that the states with high population density and consequently high share of land under cultivation have low percentage share under Barren land. While the states with rugged topography and predominance of salt marshes and flooded area have very high share under this category. Almost all the states reported decline in the share under Barren and Uncultivable land. It means that the barren land is being encroached for other than agricultural purposes.

Among all the states Himachal Pradesh has been found to have extremely high percentage followed by Madhya Pradesh, Karnataka and Rajasthan under permanent pasture and grazing land. All the states except Uttar Pradesh and Himachal Pradesh reported decline in the share under this category. The most profound change has been seen in the states of Arunachal Pradesh, Himachal Pradesh, Orissa, Bihar, Haryana and Rajasthan.

Unscientific method of cultivation and other similar farm practices may make earlier cultivated area abandoned due to unsuitability of the same on account of soil deficiencies. The states of Meghalaya, Mizoram, Rajasthan and Gujarat have very high percentage of land of the total reported area under culturable wasteland, while at the other hand Haryana, Punjab and West Bengal has very less percentage of land under this category. The decrease is observed in all states except Gujarat in culturable wasteland, which conversely showed positive growth. Punjab and Assam reported very significant decline in this category.

It is observed that most of the states with high rural population density and having intensified cropping pattern have a little share of land as other than current fallow of the total reported area. The states of Haryana, Punjab, Gujarat, West Bengal, Jammu and Kashmir, Himachal Pradesh, Andhra Pradesh, Kerala, Tripura and Arunachal Pradesh have very less land under other than current fallows. On the other hand, some states namely Tamil Nadu Andhra Pradesh, Bihar, Meghalaya and Mizoram reported very high share of their reporting area lying fallow land other than current fallows. Gujarat, Assam, Karnataka and Madhya Pradesh have sown negative growth in the case of other than current fallow land. The three states of Madhya Pradesh, Rajasthan and Bihar have registered no significant change in land under other than current fallow. On the other hand Orissa, Tamil Nadu, Andhra Pradesh, Maharashtra and Uttar Pradesh have shown positive growth.

The states of Punjab, Sikkim, Arunachal Pradesh, Tripura, Manipur, and Mizoram have very less amount of land under Current Fallows. Punjab, which is characterized with the highest intensification of cropping and having the highest percentage share under cultivated land among all the states, have the lowest share under this category. The states of north-eastern region of India which, have very less opportunity of land for ploughing, are showing similarly very low percentage share, indicating the maximum utilization of land for crop production land under this category. On the other hand Bihar, Andhra Pradesh, Tamil Nadu, Karnataka and Rajasthan have very high share of their reporting area under this category. Only three states namely Punjab, Orissa, and Gujarat have shown negative change. The three states of Haryana, Madhya Pradesh and Tamil Nadu have registered no significant change. On the other hand the remaining states have sown positive growth in current fallow.

The states Punjab and Haryana have an extremely high share of more than 80 percent under the net area sown. West Bengal is another one which occupies the third rank with 63 % of total reported area as net sown area. In the states of Uttar Pradesh, Maharashtra, Kerala, Karnataka, Gujarat, Bihar, Tamil Nadu, Rajasthan, Andhra Pradesh and Madhya Pradesh net area sown varies between 40 to 60 percent. Orissa, Assam and Tripura have net sown area between 20 to 40 percent. The states of Jammu & Kashmir, Himachal Pradesh, Meghalaya, Manipur, Nagaland, and Arunachal Pradesh have very

low percentage as net sown area i.e. less than 20 percent of total reported area. The trend of net area sown in majority of the states is showing very little or no increase except some of the North-Eastern states which had experienced a substantial increase. The net area sown in India has ceased to increase in general after 1970s. Since, smaller North-Eastern states had traditional very less percentage of net sown area; under recent increasing pressure on land they have shown a rapid increase and they had unlike, bigger agricultural states, the scope too to increase it.

The spatial pattern of distribution of multiple cropped areas, reveals a wide range of variation from one state to another in the extent of intensification of ploughing. In fact the intensification of farming depends, to a large extent, on such factors as physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. In the three states of Punjab, Haryana and West Bengal, intensification of cropping is very high i.e. more than 70 percent. Among these Punjab tops the list of all states in India with 91.53 percent of net sown area. This trend in Haryana and Punjab hardly needs explanation as these are the celebrated green revolution states, while, West Bengal owe its intensification to subsistence nature of agriculture better called 'oriental agriculture' where pressure on land is tremendous. People, there cannot afford to have fallow land. While, Meghalaya, Tamil Nadu, Karnataka, Gujarat, Nagaland and Mizoram have very less intensification of cropping i.e. less than 20 percent. The factors mentioned earlier like, physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. are responsible behind the dismal performance in these states. One or more of these factors are constantly keeping the intensity very low. The changes in area sown more than once indicate that, while most of states have achieved positive growth except some exception.

# Pressure of Population on Land

## Chapter three

# Chapter 3

## Pressure of Population on Land

**Introduction:**

The problem of increasing population pressure on land is of paramount importance. The increase in population pressure is likely to bring about significant changes in land use. Demographic and economic factors are the two main factors that affect the pattern of land utilisation in a territory. In the previous chapter we have discussed about pattern and changes in land use. Now in the present chapter we will discuss about interstate variation and changes in population pressure and rural-urban population distribution.

**Pressure of Population on Land:**

The pressure of population on land is measured by various methods such as crude population density, physiological density, agricultural density etc. These all types of measures of density have varying degree of utility in different ways. Here population pressure on land has been measured by crude rural population density, physiological density and agricultural density.

**Rural Population Density:**

Rural density, which shows persons inhabited per k.m.$^2$ in rural area is presented in table (3.1). It is evident from table that among all states West Bengal occupies the first rank with highest rural density of 674 persons per k.m.$^2$. It is followed by Kerala (664), Bihar (559), Haryana (346), Punjab (328) and Assam (300) in this order. Rural densities of Tamil Nadu, Tripura, Andhra Pradesh and Orissa range between 200 persons to 300

persons per k.m.$^2$ of area. All the other states have less than 100 persons per k.m.$^2$ (2001).

It is seen from the table that fastest growth in rural density was reported in Nagaland. Its rural density was 28 persons per k.m.$^2$ in 1971 increased to 100 persons per k.m.$^2$ in 2001. Assam, Meghalaya and Rajasthan, similarly, experienced rapid growth in density during study period. They had rural density of 137, 39 and 63 persons per k.m.$^2$ increased to 300, 128 and 83 persons per k.m.$^2$ in 2001. Through the close depiction of data and figure (3.1 and 3.2) It is observed that Kerala was only one state where rural density was very high (more than 400 person per k.m.$^2$) in 1971, but in West Bengal was added in this category in 1981, Bihar in 1991 and Utter Pradesh in 2001. Assam and Haryana where densities were low (100-200 persons per k.m.$^2$) shifted to high densely populated categories of states (300-400 person per k.m.$^2$) in 1991. Orissa was added in moderate category of 200-300 persons per k.m.$^2$ category from low density of 100-200 per k.m.$^2$ category. Similarly Madhya Pradesh and Rajasthan were added in low category of rural density of 100-200 persons per k.m.$^2$ from very low category of less than 100 persons per k.m.$^2$.

**Physiological Density:**

Physiological density gives fairly realistic pattern of population distribution since it shows the relation of population numbers to the habitat part of the land (cultivable area).

# FIG. 3.1
# INDIA: RURAL POPULATION DENSITY (1971)

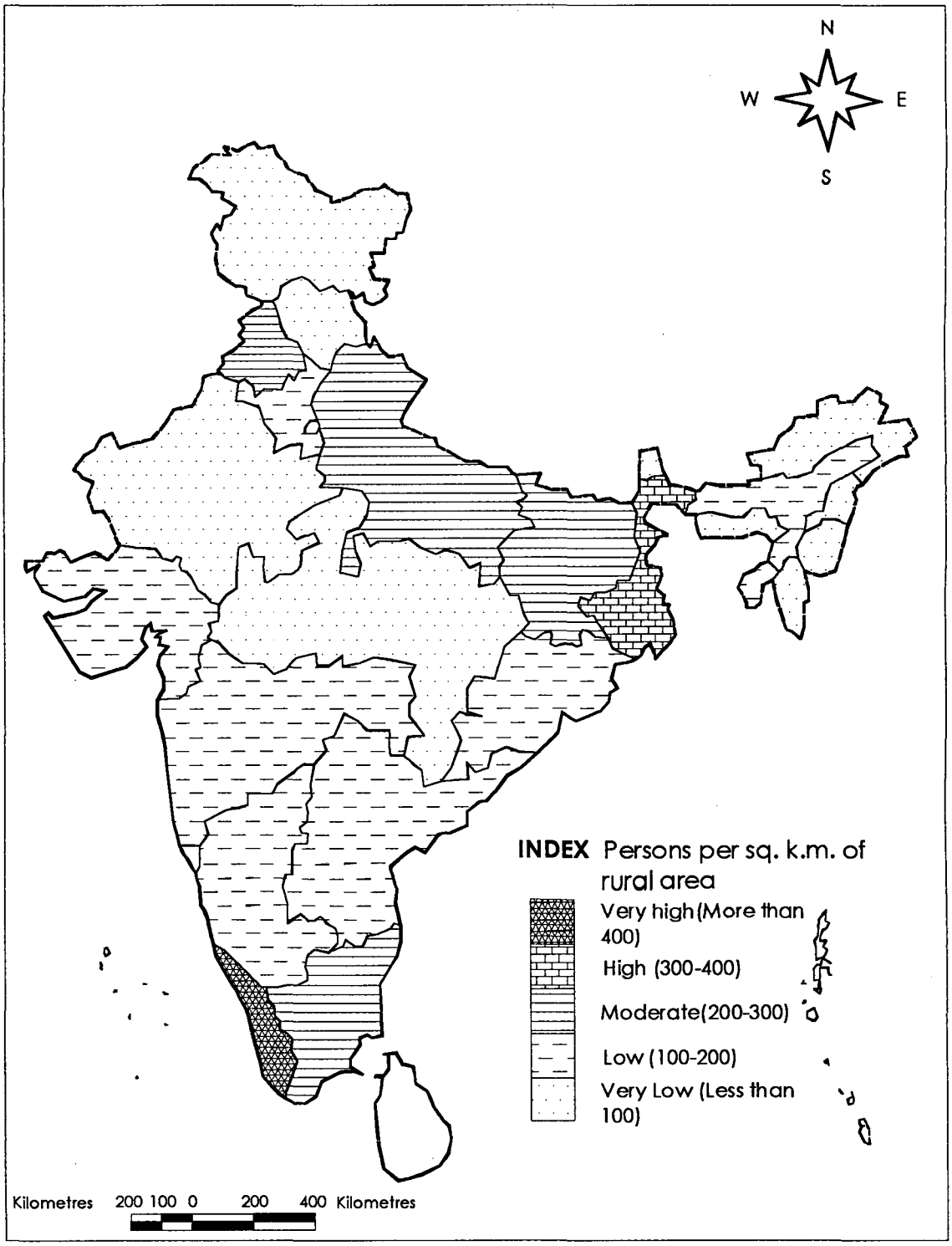
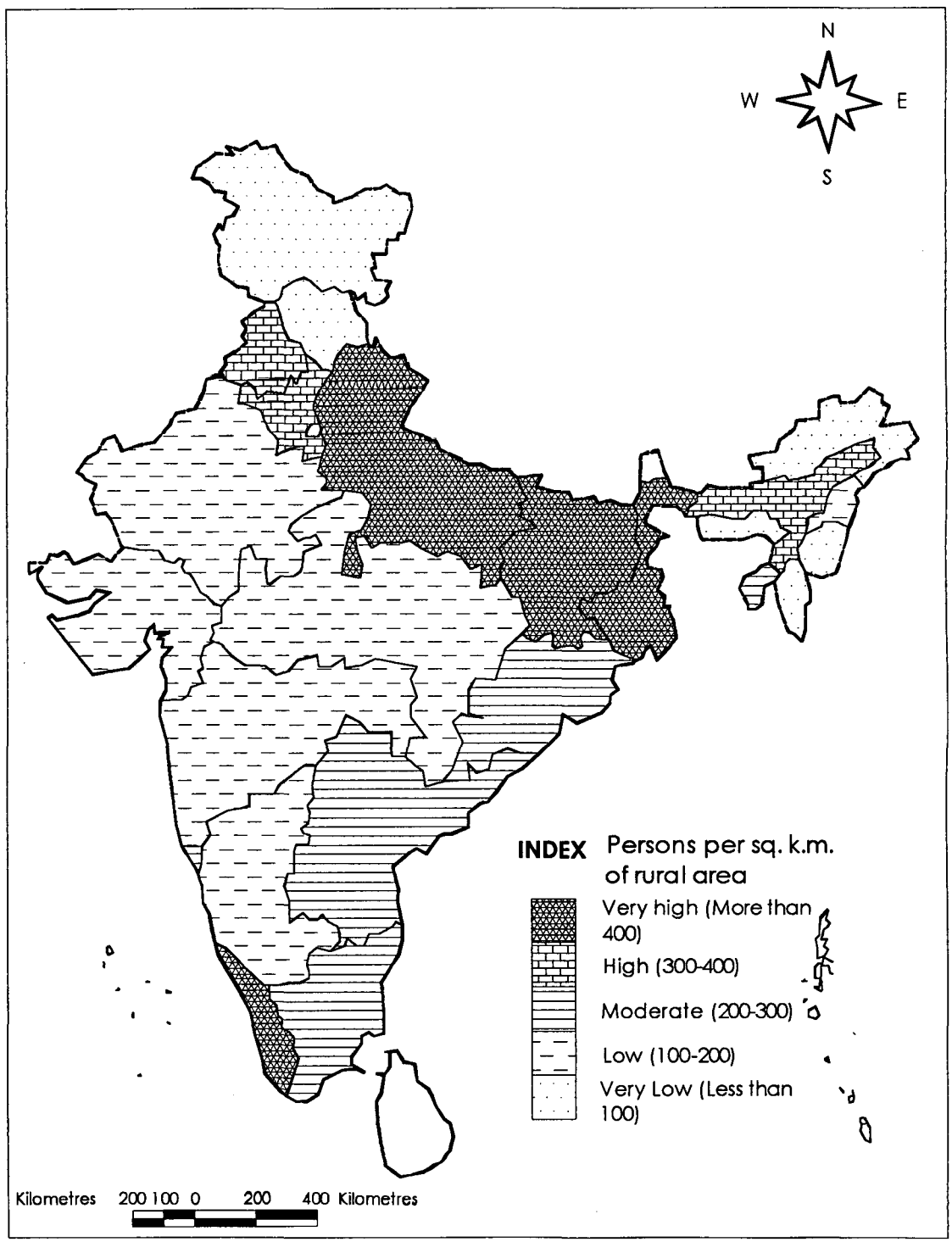


**FIG. 3.2**
**INDIA: RURAL POPULATION DENSITY**
**(2001)**



## Table 3.1

## Rural Density: State Wise (1971, 1981, 1991, 2001)

Persons per k.m.$^2$

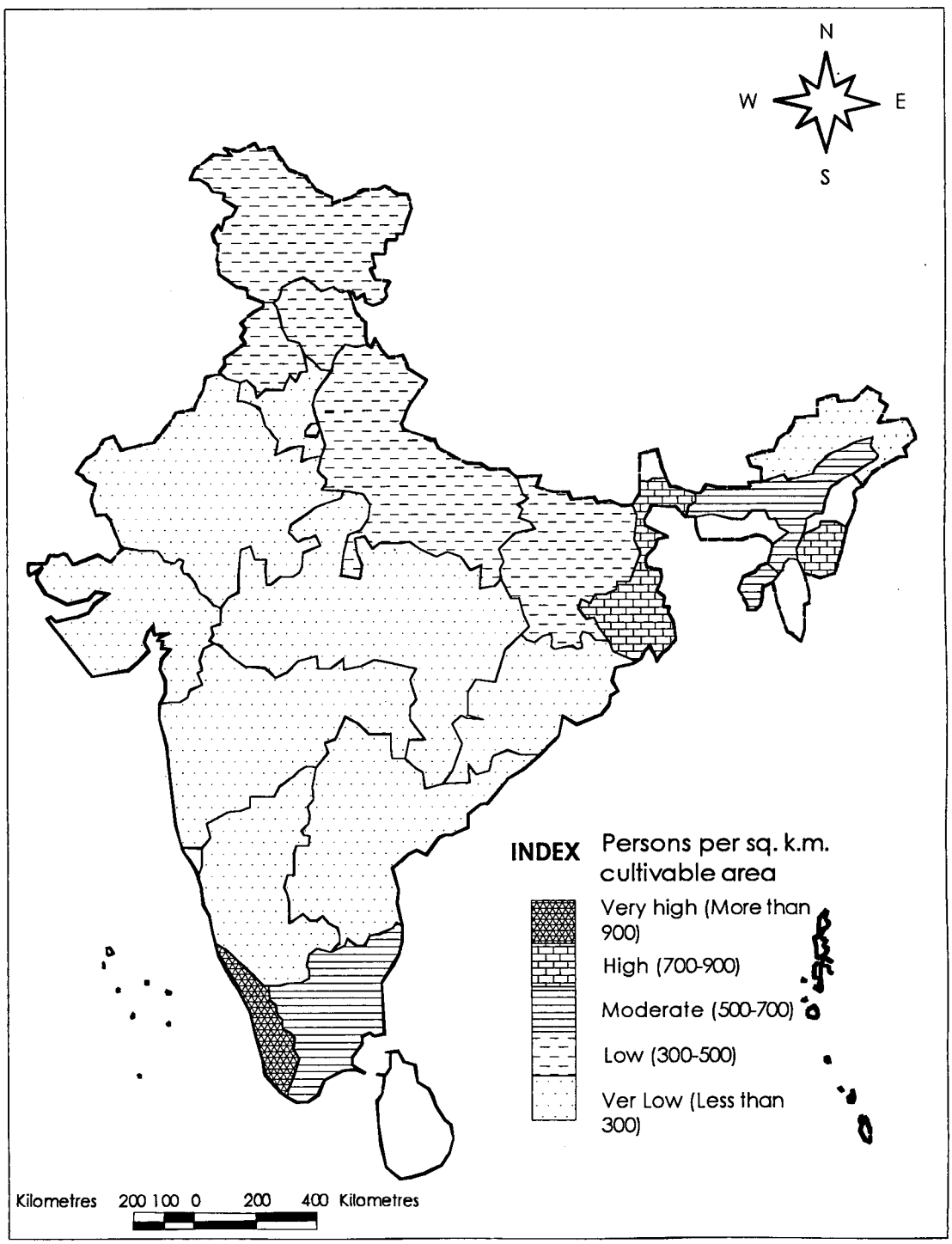
| States | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|
| Andhra Pradesh | 128 | 152 | 180 | 205 |
| Arunachal Pradesh | - | - | - | - |
| Assam | 137 | - | 257 | 300 |
| Bihar | 296 | 359 | 441 | 559 |
| Goa | - | - | 208 | 204 |
| Gujarat | 100 | 123 | 142 | 166 |
| Haryana | 189 | 232 | 287 | 346 |
| Himachal Pradesh | 58 | 71 | 85 | 99 |
| Jammu & Kashmir | - | 21 | - | 34 |
| Karnataka | 118 | 140 | 166 | 186 |
| Kerala | 477 | 558 | 603 | 664 |
| Madhya Pradesh | 79 | 95 | 116 | 140 |
| Maharashtra | 115 | 135 | 161 | 185 |
| Manipur | 42 | 47 | 60 | 82 |
| Meghalaya | 39 | 49 | 65 | 83 |
| Mizoram | - | 18 | 18 | 22 |
| Nagaland | 28 | 40 | 61 | 100 |
| Orissa | 130 | 152 | 179 | 204 |
| Punjab | 208 | 247 | 292 | 328 |
| Rajasthan | 63 | 80 | 101 | 128 |
| Sikkim | - | - | - | - |
| Tamil Nadu | 231 | 261 | 297 | 281 |
| Tripura | 134 | 175 | 226 | 256 |
| Uttar Pradesh | 260 | 314 | 386 | 477 |
| West Bengal | 388 | 466 | 576 | 674 |
| INDIA | 148 | 166 | 214 | 254 |

Table 3.2 presents the physiological density of different states for four points of times taken for the study. Physiological density has been worked out by dividing the total population of a state by total cultivable area (includes net sown area, fallow land and cultivable waste land).

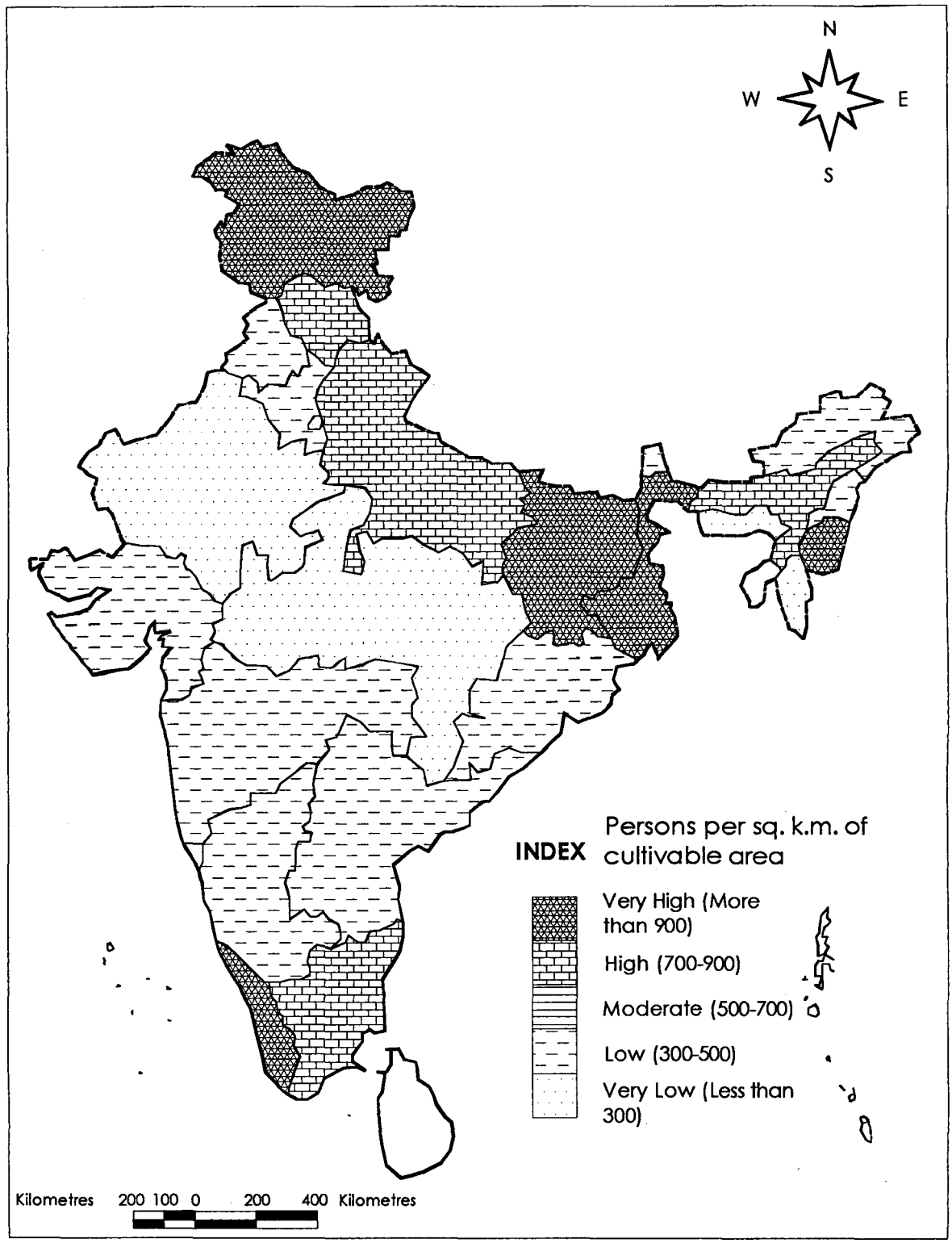
It is evident from table that there is sharp areal variation in physiological density from 200 persons per k.m.$^2$ in Mizoram to 1706 persons per k.m.$^2$ in Manipur. The very highly dense populated states where the densities are more than 900 persons per k.m.$^2$ are Manipur, West Bengal, Kerala, Tripura, Bihar and Jammu & Kashmir. The very low densely populated states, where densities are less than 300 persons per k.m.$^2$ are Madhya Pradesh, Meghalaya, Rajasthan and Mizoram. The states of Assam, Uttar Pradesh, and Tamil Nadu have high density of 700 to 900 persons per k.m.$^2$. Punjab, Haryana, Orissa, Andhra Pradesh, Maharashtra, Gujarat, Karnataka, Nagaland, Sikkim and Andhra Pradesh have comparatively low density of 300-500 persons per k.m$^2$ (fig 3.3).

The changes occurred in physiological density from 1971 to 2001 is revealed from table 3.3 and map 3.3 and 3.4. Among all states the states of Arunachal Pradesh registered the maximum increase in physiological density. Physiological density of this state was 107 persons per k.m.$^2$ in 1971 increased consistently to 438 persons in 2001. Thus more than three times increase is reported in physiological density during three decades. The some other states fallowed after Arunachal Pradesh are Manipur, Jammu & Kashmir, Rajasthan, Bihar and Haryana which are showing more than double increase in the density during thirty years. The other two states of Maharashtra and Uttar Pradesh showed almost double increase in density.

**FIG. 3.3**
**INDIA: PHYSIOLOGICAL DENSITY (1971)**



# FIG. 3.4
# INDIA: PHYSIOLOGICAL DENSITY (2001)



## Table: 3.2

## Physiological Density (1971, 1981, 1991, 2000)

Persons per K.M$^2$

| States | 1971 | 1981 | 1991 | 2001 | % Change |
|---|---|---|---|---|---|
| Andhra Pradesh | 281 | 345 | 425 | 485 | 72.87 |
| Arunachal Pradesh | 108 | 193 | 388 | 438 | 306.87 |
| Assam | 542 | 663 | 757 | 886 | 63.30 |
| Bihar | 494 | 612 | 797 | 1046 | 111.99 |
| Gujarat | 241 | 274 | 334 | 409 | 69.67 |
| Goa | - | - | - | - | - |
| Haryana | 267 | 339 | 437 | 553 | 107.08 |
| Himachal Pradesh | 451 | 504 | 674 | 820 | 81.78 |
| Jammu &Kashmir | 475 | 621 | 803 | 1030 | 116.78 |
| Karnataka | 237 | 299 | 358 | 419 | 76.48 |
| Kerala | 929 | 1070 | 1206 | 1315 | 41.51 |
| Madhya Pradesh | 189 | 231 | 291 | 357 | 88.77 |
| Maharashtra | 236 | 300 | 376 | 463 | 96.35 |
| Manipur | 599 | 1015 | 1312 | 1706 | 184.69 |
| Meghalaya | - | 139 | 193 | 249 | - |
| Mizoram | - | - | 119 | 200 | - |
| Nagaland | 516 | 111 | 234 | 402 | -22.21 |
| Orissa | 288 | 376 | 438 | 510 | 76.72 |
| Punjab | 317 | 393 | 465 | 562 | 77.21 |
| Rajasthan | 103 | 133 | 171 | 220 | 114.00 |
| Sikkim | - | 326 | 373 | 496 | - |
| Tamil Nadu | 502 | 584 | 683 | 772 | 53.83 |
| Tripura | 630 | 815 | 1010 | 1128 | 78.96 |
| Uttar Pradesh | 440 | 547 | 685 | 862 | 95.73 |
| West Bengal | 755 | 897 | 1157 | 1396 | 84.97 |
| **Mean** | **409.56** | **449.51** | **570.17** | **696.76** | |
| **S.D** | **212.97** | **278.78** | **339.06** | **401.58** | |
| **C.V** | **52.00** | **62.02** | **59.47** | **57.64** | |

It is evident from fig. 3.3 and 3.4 that Kerala was only one state, which has very high physiological density of more than 900 persons per k.m.$^2$ in 1971, but in 2001 Bihar, West Bengal, Jammu & Kashmir, Manipur and Tripura were newly added in very high density of physiological density. Similarly Assam and Tamil Nadu have moderate density of 500-700 persons per k.m.$^2$ in 1971 are showing high density of 700-900 persons per k.m.$^2$ in 2001. Uttar Pradesh and Himachal Pradesh were characterised with low of physiological density in 1971 shifted to the category of high physiological density in 2001. Punjab, Haryana, Orissa, Andhra Pradesh, Maharashtra, Gujarat, Karnataka shifted to low density from very low density.

Coefficient of variation has been calculated to know the variation in population density. It is observed that coefficient of variation was 52 percent in 1971 increased to 62.02 percent in 1981 and again declined to 59.47 percent and 57.64 percent in 1981 and 1991 respectively.

**Agricultural Density:**

In the previous section pressure on land was analysed in terms of total population inhabited in per squire k.m.$^2$ of geographical area and cultivable area. The picture that emerges from crude population density and physiological density is in fact a not true measure of population pressure on land since the total population of a state does not dependent on agriculture. Hence in order to have a more accurate picture of population pressure on agricultural land other measure agriculture density is suggested. Agriculture density affords an understanding of the spatial relationship between the agricultural population and agricultural land. Agricultural density, in the present study, has been worked out by dividing the agricultural population by net cultivated area. Agricultural

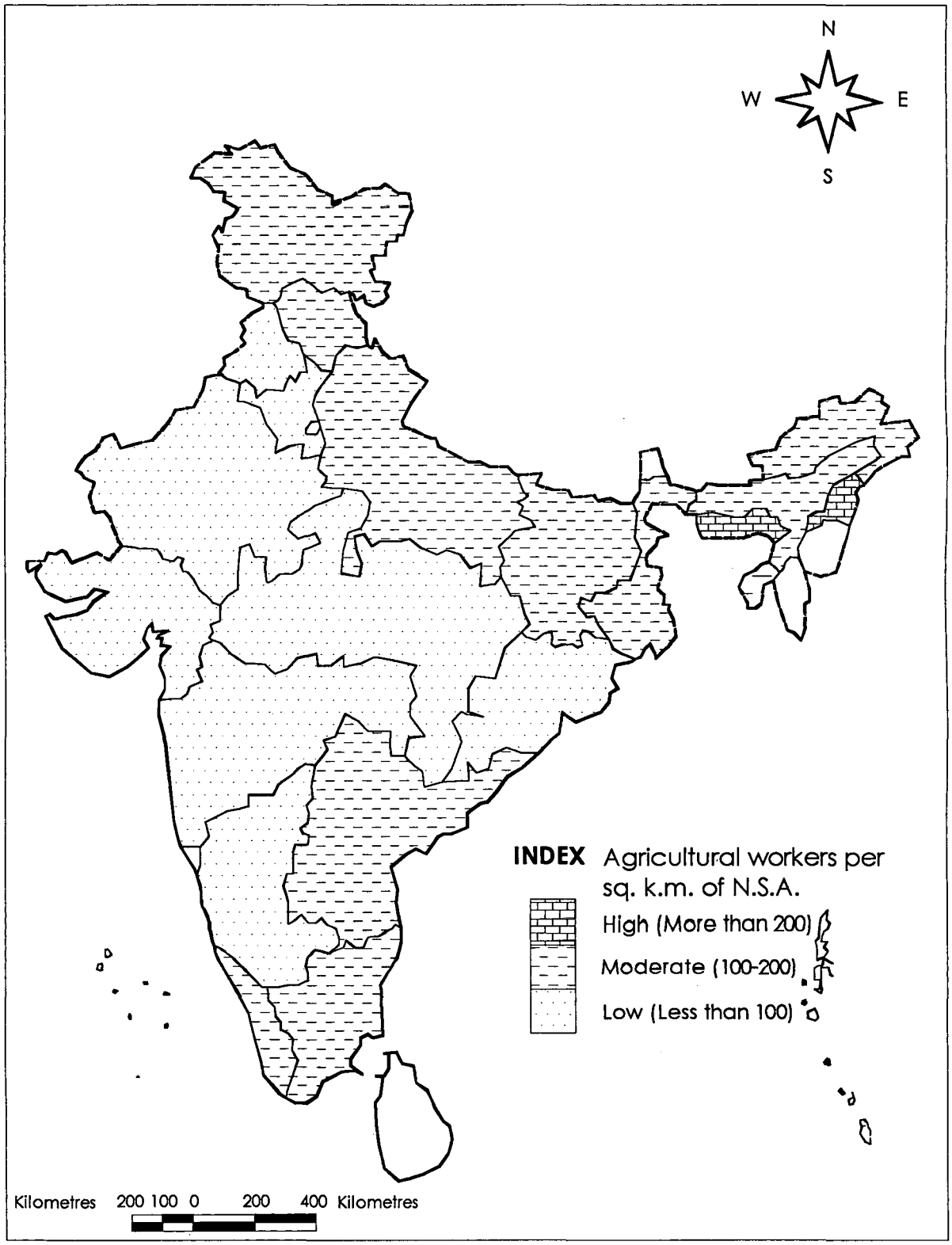
population of states has been calculated by adding the population of cultivators and agricultural labors together from workers categories.

It is evident from table (3.3) that there is marked spatial variation in agricultural density among states. At the two extremes Manipur is the most agriculturally populated state where agricultural density is 438 persons per k.m.$^2$ while Punjab is lowest one where density is only 85 persons per k.m.$^2$. Bihar and Meghalaya lie after Manipur where the density is more than 300 persons per k.m.$^2$ of cultivated area. Mizoram, Jammu & Kashmir, Tamil Nadu, West Bengal, Uttar Pradesh and Nagaland have density between 300 to 200 persons per k.m.$^2$. The density of Andhra Pradesh, Assam, Madhya Pradesh, Arunachal Pradesh, Sikkim, Orissa, Maharashtra, Karnataka, Haryana, Gujarat and Kerala range between 100 to 200 persons per k.m.$^2$ (fig. 3.6).

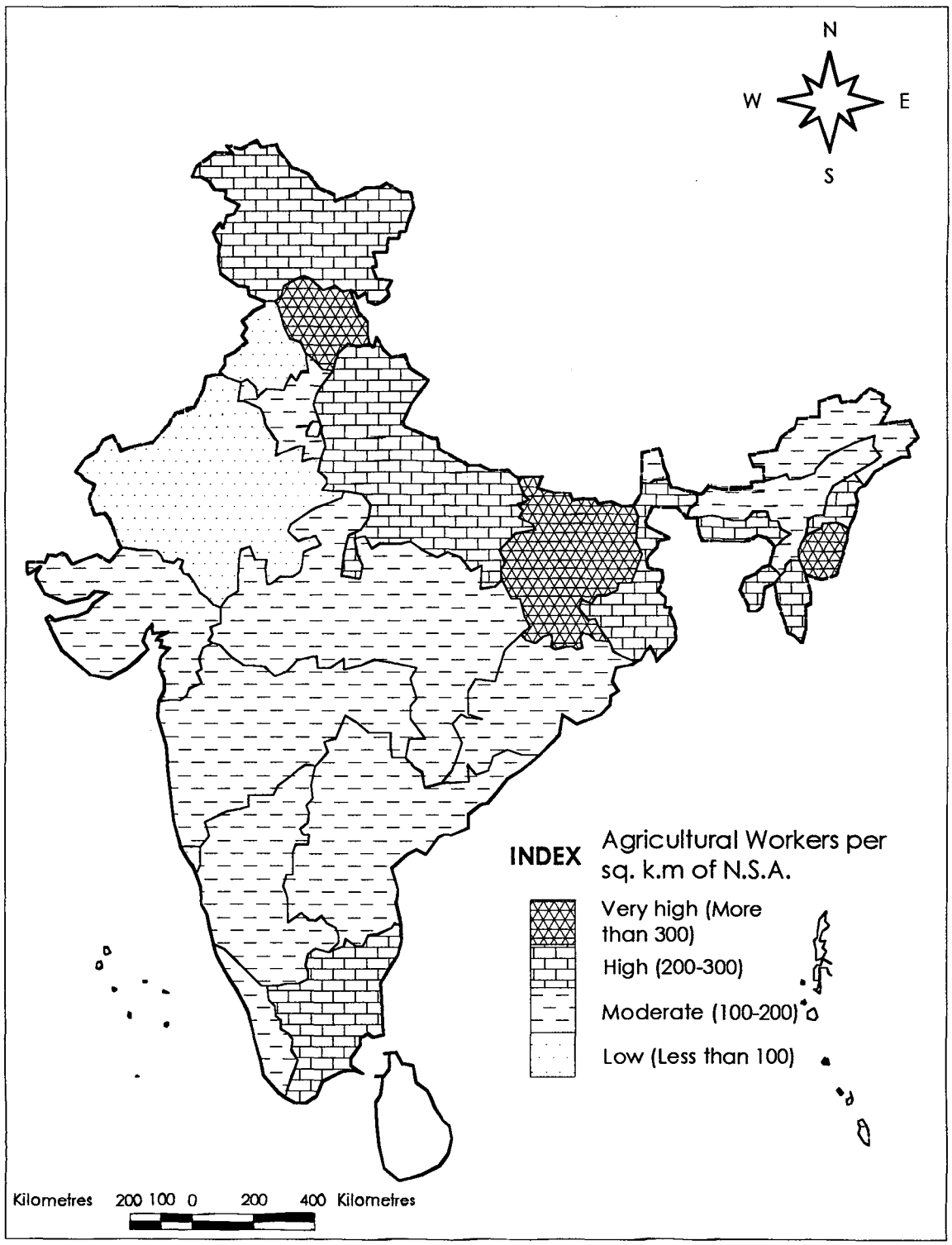
The greatest change has been reported in Manipur where the agricultural density increased three times since 1971. Density was 146 persons per k.m.$^2$ in 1971 increased continuously to 438 persons per k.m.$^2$ in 2001 from decade to decade. The states of Madhya Pradesh, Rajasthan, Haryana, Bihar, Himachal Pradesh and Maharashtra are the states where two times increase have been noted in density from 1971 to 2001. Kerala and Arunachal Pradesh showed decrease in agriculture density during study period.

Fig. 3.5 and 3.6 presents the agricultural density of states for 1971 and 2001. It is noted that the states of Bihar, Himachal Pradesh, and Manipur had low density in 1971 characterized with high density of more than 300 persons per k.m.$^2$ in 2001. Agricultural density of Jammu & Kashmir, Tamil Nadu, West Bengal and Uttar Pradesh were ranging between 100 to 200 persons per k.m.$^2$ in 1971 increased to 200-300 persons per k.m.$^2$ in

## FIG. 3.5
## INDIA: AGRICULTURAL DENSITY (1971)



## FIG. 3.6
## INDIA: AGRICULTURAL DENSITY (2001)



## Table: 3.3

# Agricultural Density (1971, 1981, 1991, 2001)

Persons per K.M$^2$

| States | 1971 | 1981 | 1991 | 2001 | % Change |
|---|---|---|---|---|---|
| Andhra Pradesh | 108 | 147 | 177 | 198 | 83.95 |
| Arunachal Pradesh | 188 | 206 | 172 | 162 | -13.76 |
| Assam | 127 | - | 163 | 186 | 47.24 |
| Bihar | 170 | 197 | 268 | 383 | 125.31 |
| Goa | - | - | 70 | 61 | - |
| Gujarat | 58 | 69 | 84 | 110 | 87.58 |
| Haryana | 49 | 62 | 76 | 119 | 145.09 |
| Himachal Pradesh | 176 | 182 | 203 | 374 | 112.72 |
| Jammu & Kashmir | 132 | 153 | - | 252 | 91.02 |
| Karnataka | 66 | 81 | 105 | 125 | 89.14 |
| Kerala | 139 | 129 | 140 | 106 | -23.65 |
| Madhya Pradesh | 66 | 82 | 96 | 168 | 153.21 |
| Maharashtra | 65 | 82 | 103 | 131 | 101.60 |
| Manipur | 146 | 281 | 346 | 438 | 199.48 |
| Meghalaya | 217 | 218 | 240 | 285 | 31.63 |
| Mizoram | - | - | 289 | 257 | - |
| Nagaland | 207 | 182 | 199 | 222 | 6.96 |
| Orissa | 87 | 105 | 120 | 153 | 76.19 |
| Punjab | 60 | 68 | 80 | 85 | 40.35 |
| Rajasthan | 39 | 47 | 58 | 98 | 148.11 |
| Sikkim | - | 109 | 114 | 156 | - |
| Tamil Nadu | 147 | 216 | 243 | 245 | 65.81 |
| Tripura | 134 | 166 | 183 | 213 | 58.86 |
| Uttar Pradesh | 122 | 140 | 173 | 214 | 74.91 |
| West Bengal | 130 | 152 | 204 | 238 | 82.74 |
| **Mean** | **120** | **140** | **163** | **199** | |
| **S.D** | **53** | **62** | **77** | **96** | |
| **C.V** | **43.98** | **44.29** | **46.98** | **48.24** | |

2001. Karnataka, Madhya Pradesh, Orissa, Maharashtra, Haryana, Gujarat have density of less than 100 in 1971 characterised with relatively higher density of 100 to 200 persons per k.m.$^2$ in 2001.

Coefficient of variation is found to be increasing from decade to decade i.e. 43.98 percent in 1971, 44.29 percent in 1981, 46.98 percent in 1991 and 48.24 percent, denotes state wise variation in agricultural density has increased from one point of time to another. This is also suggesting that agricultural density has increased rapidly in those states where density was already high.

**Concentration of Population:**

The percentage share of rural, urban population of states in country's total rural, urban population has been worked out to know the relative concentration of population in the states and changes therein over period.

It is observed from table (3.4) that among all states, Uttar Pradesh and Bihar have the highest percentage share in the country's rural population in all census years taken for the study. Both these states constitute together about 30 percent of total population of India. The four states of Madhya Pradesh, West Bengal, Maharashtra and Andhra Pradesh constitute another 30 percent of the total rural population of India. Their percentage share ranges from 7 percent to 9 percent. Another 30 percent is constituted by nine states of Rajasthan, Tamil Nadu, Karnataka, Gujarat, Orissa, Kerala, Assam, Punjab and Haryana. The percentage share of these states varies between 2 to 7 percent. The rest 10 present is shared by remaining states.

It is evident from table that Maharashtra and Uttar Pradesh are the two states, which have highest share of urban population in country's total urban population. Their

percentage shares are 14.37 percent and 12.86 percent respectively of total urban population of India (2001). The states of Tamil Nadu, West Bengal, Andhra Pradesh, and Madhya Pradesh share 9.55 percent, 7.88percent, 7.19 percent and 7.11 percent respectively of the total urban population of India. While Gujarat, Karnataka, Bihar, Rajasthan, Kerala, Punjab, Haryana, Orissa and Assam have 6.62 percent, 6.28 percent, 5.14 percent, 4.63 percent, 2.90 percent, 2.89 percent, 2.14 percent, 1.93 percent and 1.19 percent share respectively. Remaining states share less than one percent of the total urban population of India.

It is evident from the table (2) that the states of north-east namely Nagaland, Sikkim, Meghalaya, Arunachal Pradesh, Manipur and Tripura show very significant change in their share of rural population in country's total population, even though their shares are very less in country's total rural population. Beside the state of Rajasthan where percentage contribution of population in country's total population was already high in 1971 (4.83 percent of rural population in countries total rural population) reported significant growth in its percentage share over period (increased to 5.83 percent in 2001).

On the other hand, the states of Tamil Nadu, Kerala, Punjab, Orissa, Karnataka and Andhra Pradesh are showing decrease in their share. Their share of rural population in country's total population were 6.54, 4.07, 2.35, 4.58, 5.50 and 7.99 percent respectively in 1971, decreased to 4.70, 3.18, 2.16, 4.21, 4.69 and 7.45 percent respectively in 2001.

In the case of share in urban population, more or less same trend has been seen that less urbanized states showing significant change in their percentage share of in total countries urban population. It is again found that all north-east states, which have very

## Table: 3.4

## Population Concentration (1971, 1981, 1991, 2001)

| States | % of Total Population | % of Total Rural Population | % of Total Urban Population | % of Total Population | % of Total Rural Population | % of Total Urban Population |
|---|---|---|---|---|---|---|
| | 1971 | 1971 | 1971 | 1981 | 1981 | 1981 |
| Andhra Pradesh | 7.94 | 7.99 | 7.70 | 8.049 | 8.09 | 7.92 |
| Arunachal Pradesh | 0.09 | 0.10 | 0.02 | 0.095 | 0.12 | 0.03 |
| Assam | 2.67 | 3.04 | 1.18 | - | - | - |
| Bihar | 10.28 | 11.55 | 5.16 | 10.509 | 12.06 | 5.53 |
| Gujarat | 4.87 | 4.37 | 6.87 | 5.123 | 4.63 | 6.72 |
| Haryana | 1.83 | 1.88 | 1.62 | 1.942 | 1.99 | 1.79 |
| Himachal Pradesh | 0.63 | 0.73 | 0.22 | 0.643 | 0.78 | 0.21 |
| Jammu & Kashmir | 0.84 | 0.86 | 0.79 | 0.900 | 0.93 | 0.80 |
| Karnataka | 5.34 | 5.05 | 6.53 | 5.582 | 5.20 | 6.80 |
| Kerala | 3.89 | 4.07 | 3.18 | 3.826 | 4.07 | 3.03 |
| Madhya Pradesh | 7.60 | 7.94 | 6.22 | 7.843 | 8.19 | 6.71 |
| Maharashtra | 9.20 | 7.90 | 14.40 | 9.437 | 8.04 | 13.95 |
| Manipur | 0.20 | 0.21 | 0.13 | 0.214 | 0.21 | 0.24 |
| Meghalaya | 0.18 | 0.19 | 0.13 | 0.201 | 0.22 | 0.15 |
| Mizoram | 0.06 | 0.07 | 0.03 | 0.074 | 0.07 | 0.08 |
| Nagaland | 0.09 | 0.11 | 0.05 | 0.116 | 0.13 | 0.08 |
| Orissa | 4.00 | 4.58 | 1.69 | 3.964 | 4.58 | 1.97 |
| Punjab | 2.47 | 2.35 | 2.95 | 2.524 | 2.39 | 2.95 |
| Rajasthan | 4.70 | 4.83 | 4.16 | 5.150 | 5.33 | 4.57 |
| Sikkim | 0.04 | 0.04 | 0.02 | 0.048 | 0.05 | 0.03 |
| Tamil Nadu | 7.52 | 6.54 | 11.42 | 7.276 | 6.39 | 10.12 |
| Tripura | 0.28 | 0.32 | 0.15 | 0.309 | 0.36 | 0.14 |
| Uttar Pradesh | 16.12 | 17.30 | 11.35 | 16.664 | 17.92 | 12.62 |
| West Bengal | 8.08 | 7.59 | 10.05 | 8.204 | 7.91 | 9.16 |

| States | % of Total Population | % of Total Rural Population | % of Total Urban Population | % of Total Population | % of Total Rural Population | % of Total Urban Population |
|---|---|---|---|---|---|---|
| | 1991 | 1991 | 1991 | 2001 | 2001 | 2001 |
| Arunachal Pradesh | 7.931 | 7.81 | 8.290 | 0.11 | 0.12 | 0.08 |
| Mizoram | 0.103 | 0.12 | 0.051 | 0.09 | 0.06 | 0.15 |
| Nagaland | 2.673 | 3.20 | 1.153 | 0.19 | 0.22 | 0.12 |
| Manipur | 10.300 | 12.05 | 5.262 | 0.23 | 0.25 | 0.20 |
| Haryana | 4.926 | 4.35 | 6.602 | 2.05 | 2.02 | 2.14 |
| Tripura | 1.963 | 1.99 | 1.879 | 0.31 | 0.36 | 0.19 |
| Meghalaya | 0.617 | 0.76 | 0.208 | 0.22 | 0.25 | 0.16 |
| Sikkim | - | - | - | 0.05 | 0.06 | 0.02 |
| Madhya Pradesh | 5.363 | 4.99 | 6.446 | 7.90 | 8.21 | 7.11 |
| Orissa | 3.470 | 3.44 | 3.559 | 3.57 | 4.21 | 1.93 |
| Uttar Pradesh | 7.892 | 8.16 | 7.109 | 16.99 | 18.59 | 12.86 |
| Jammu & Kashmir | 9.413 | 7.77 | 14.155 | 0.98 | 1.02 | 0.88 |
| Rajasthan | 0.219 | 0.21 | 0.234 | 5.50 | 5.83 | 4.63 |
| Assam | 0.212 | 0.23 | 0.153 | 2.59 | 3.13 | 1.19 |
| Maharashtra | 0.082 | 0.06 | 0.147 | 9.42 | 7.51 | 14.37 |
| Bihar | 0.144 | 0.16 | 0.097 | 10.69 | 12.83 | 5.14 |
| Punjab | 3.775 | 4.40 | 1.963 | 2.37 | 2.16 | 2.89 |
| Gujarat | 2.419 | 2.29 | 2.778 | 4.93 | 4.27 | 6.62 |
| Karnataka | 5.248 | 5.45 | 4.666 | 5.13 | 4.69 | 6.28 |
| Himachal Pradesh | 0.048 | 0.06 | 0.017 | 0.59 | 0.74 | 0.21 |
| Andhra Pradesh | 6.661 | 5.91 | 8.842 | 7.37 | 7.45 | 7.19 |
| Kerala | 0.329 | 0.37 | 0.195 | 3.10 | 3.18 | 2.90 |
| Tamil Nadu | 16.589 | 17.90 | 12.794 | 6.05 | 4.70 | 9.55 |
| West Bengal | 8.118 | 7.93 | 8.670 | 7.81 | 7.78 | 7.88 |

less percentage share in countries total urban population, are showing significant increase in their share. Besides that, comparatively more urbanised states of West Bengal, Tamil Nadu, Kerala, Andhra Pradesh, Karnataka and Gujarat show decrease in their share in total urban population of India (table3.4).

**Rural-Urban Distribution of Population:**

In order to derive the interstate variation and concentration of population in rural-urban break up, Location Quotient has been worked out in the present study. Location quotients for different periods of study are given in table (1).

At all points of times taken for the study, the value of location quotient show a higher concentration of rural population in Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Nagaland, Orissa, Sikkim and Tripura, as L.Q are more than unity in all these states. While In Andhra Pradesh, Haryana, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Rajasthan, Uttar Pradesh and West Bengal concentration of rural population is quite balance because L.Q. is 1. In the remaining all states of Gujarat, Karnataka, Maharashtra, Punjab, Tamil Nadu and West Bengal rural population is much dispersed, as L.Q. is less than 1.

In 1971 and 1981 the value of location quotient shows higher concentration of urban population in the states of Gujarat, Karnataka, Maharashtra, Punjab, Tamil Nadu and West Bengal, as L.Q. was more than unity. While in the states of Andhra Pradesh and Jammu & Kashmir, the concentration of urban population were quite balance as L.Q. was 1. In other remaining states of Arunachal Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Orissa, Rajasthan, Tripura and Uttar Pradesh urban population is much dispersed, as L.Q. was less than 1.

**Fig: 3.7**

**Rural-Urban Distribution of Population (1971)**

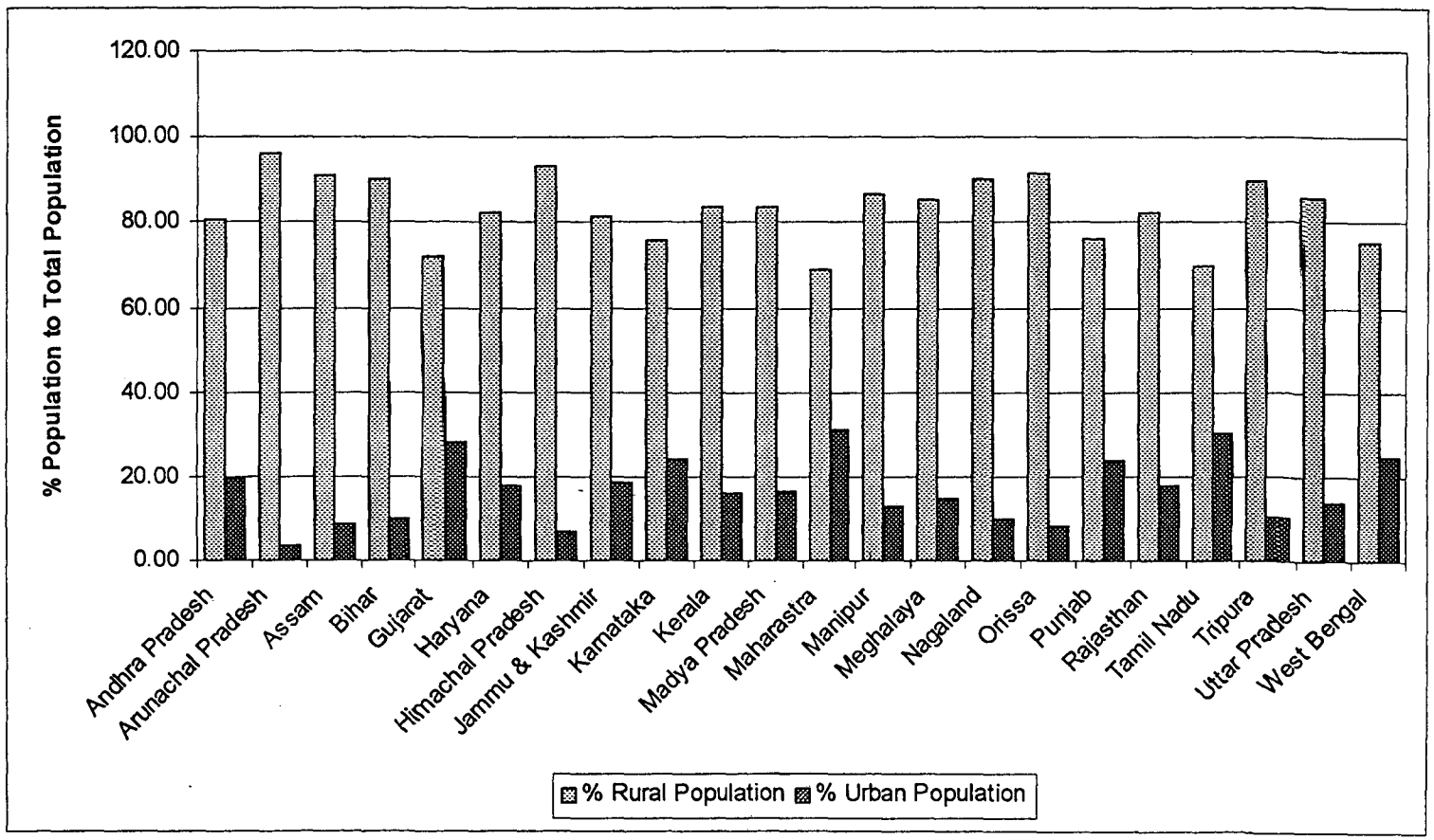
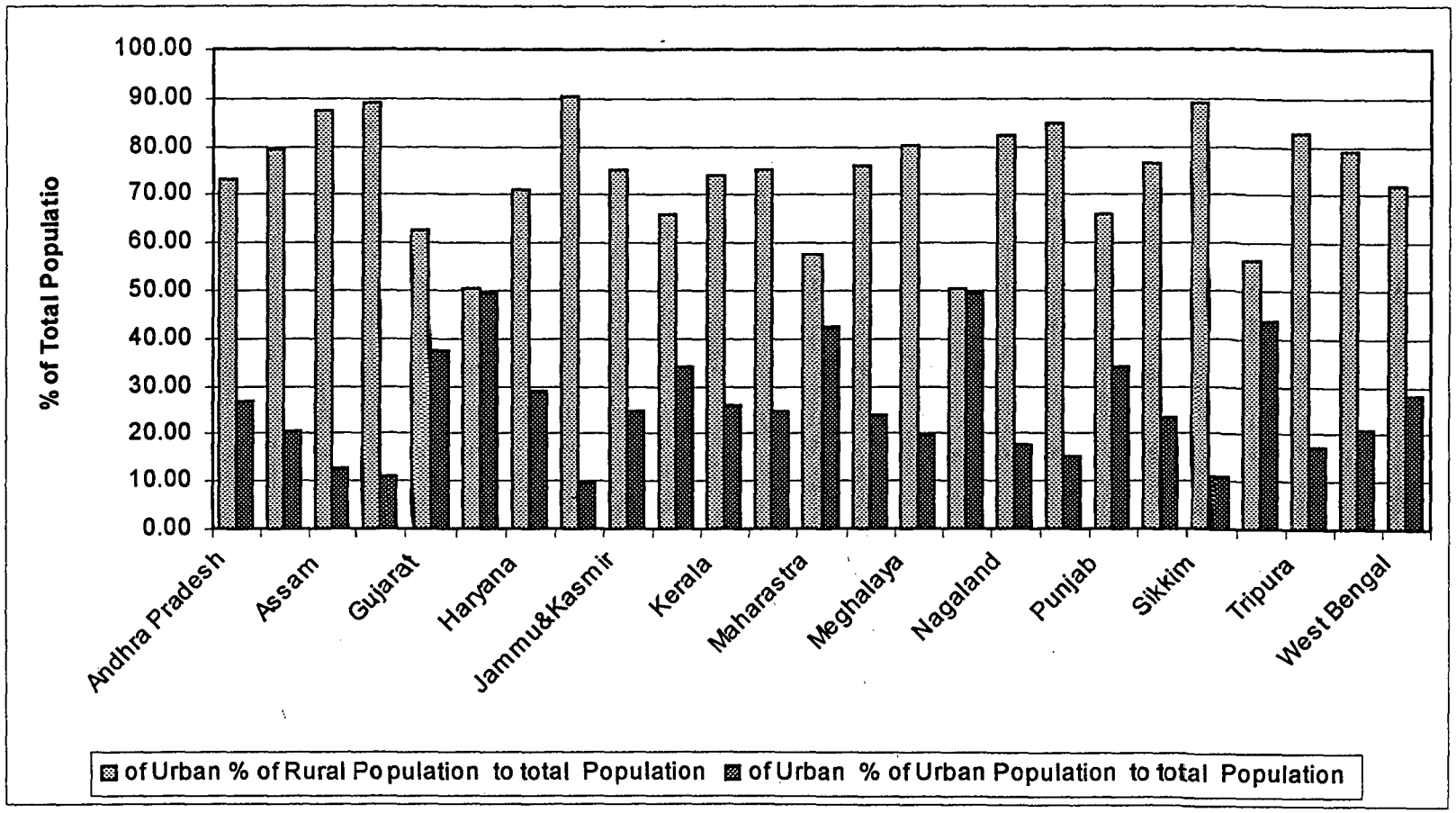


**Fig: 3.8**

**Rural –Urban Distribution of Population (2001)**



## Table: 3.5

## Rural-Urban Distribution of Population (1971, 1981, 1991, 2001)

| States | Percent of Rural Population to total Population | Percent of Urban Population to total Population | L.Q for Rural Population | L.Q. for Urban Population | Percent of Rural Population to total Population | Percent of Urban Population to total Population | L.Q for Rural Population | L.Q. for Urban Population |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1971 | 1971 | 1971 | 1981 | 1981 | 1981 | 1981 |
| Andhra Pradesh | 80.69 | 19.31 | 1.01 | 0.97 | 76.75 | 23.25 | 1.00 | 1.00 |
| Arunachal Pradesh | 96.38 | 3.62 | 1.20 | 0.18 | 93.68 | 6.32 | 1.22 | 0.27 |
| Assam | 91.18 | 8.82 | 1.14 | 0.44 | 90.12 | 9.88 | 1.18 | 0.42 |
| Bihar | 90.00 | 10.00 | 1.12 | 0.50 | 87.54 | 12.46 | 1.14 | 0.53 |
| Gujarat | 71.92 | 28.08 | 0.90 | 1.41 | 68.92 | 31.08 | 0.90 | 1.33 |
| Goa | - | - | - | - | - | - | - | - |
| Haryana | 82.34 | 17.66 | 1.03 | 0.89 | 78.04 | 21.96 | 1.02 | 0.94 |
| Himachal Pradesh | 93.01 | 6.99 | 1.16 | 0.35 | 92.28 | 7.72 | 1.20 | 0.33 |
| Jammu &Kashmir | 81.41 | 18.59 | 1.02 | 0.93 | 78.95 | 21.05 | 1.03 | 0.90 |
| Karnataka | 75.69 | 24.31 | 0.94 | 1.22 | 71.09 | 28.91 | 0.93 | 1.24 |
| Kerala | 83.76 | 16.24 | 1.05 | 0.82 | 81.22 | 18.78 | 1.06 | 0.81 |
| Madhya Pradesh | 83.71 | 16.29 | 1.05 | 0.82 | 79.69 | 20.31 | 1.04 | 0.87 |
| Maharashtra | 68.83 | 31.17 | 0.86 | 1.57 | 64.97 | 35.03 | 0.85 | 1.50 |
| Manipur | 86.81 | 13.19 | 1.08 | 0.66 | 73.51 | 26.49 | 0.96 | 1.14 |
| Meghalaya | 85.19 | 14.81 | 1.06 | 0.74 | 81.97 | 18.03 | 1.07 | 0.77 |
| Mizoram | - | - | - | - | - | - | - | - |
| Nagaland | 90.05 | 9.95 | 1.12 | 0.50 | 84.46 | 15.54 | 1.10 | 0.67 |
| Orissa | 91.59 | 8.41 | 1.14 | 0.42 | 88.18 | 11.82 | 1.15 | 0.51 |
| Punjab | 76.27 | 23.73 | 0.95 | 1.19 | 72.28 | 27.72 | 0.94 | 1.19 |
| Rajasthan | 82.37 | 17.63 | 1.03 | 0.89 | 79.07 | 20.93 | 1.03 | 0.90 |
| Sikkim | - | - | - | - | 83.77 | 16.23 | 1.09 | 0.70 |
| Tamil Nadu | 69.74 | 30.26 | 0.87 | 1.52 | 67.02 | 32.98 | 0.87 | 1.41 |
| Tripura | 89.57 | 10.43 | 1.12 | 0.52 | 89.02 | 10.98 | 1.16 | 0.47 |
| Uttar Pradesh | 85.98 | 14.02 | 1.07 | 0.70 | 81.99 | 18.01 | 1.07 | 0.77 |
| West Bengal | 75.25 | 24.75 | 0.94 | 1.24 | 73.51 | 26.49 | 0.96 | 1.14 |
| **India** | **80.1** | **19.9** | **1.00** | **1.00** | **76.69** | **23.31** | **1.00** | **1.00** |

Table (3.5) Contd....

| States/ | Percent of Rural Population to total Population | Percent of Urban Population to total Population | L.Q Rural Population | L.Q Urban Population | Percent of Rural Population to total Population | Percent of Urban Population to total Population | L.Q Rural Population | L.Q Urban Population |
|---|---|---|---|---|---|---|---|---|
| | 1991 | 1991 | 1991 | 1991 | 2001 | 2001 | 2001 | 2001 |
| Andhra Pradesh | 73.11 | 26.89 | 0.99 | 1.03 | 72.92 | 27.08 | 1.01 | 0.97 |
| Arunachal Pradesh | 87.20 | 12.80 | 1.18 | 0.49 | 79.59 | 20.41 | 1.10 | 0.73 |
| Assam | 88.90 | 11.10 | 1.20 | 0.42 | 87.28 | 12.72 | 1.21 | 0.46 |
| Bihar | 86.86 | 13.14 | 1.18 | 0.50 | 89.18 | 10.82 | 1.23 | 0.39 |
| Gujarat | 65.51 | 34.49 | 0.89 | 1.32 | 62.65 | 37.35 | 0.87 | 1.34 |
| Goa | 58.99 | 41.01 | 0.80 | 1.57 | 50.23 | 49.77 | 0.70 | 1.79 |
| Haryana | 75.37 | 24.63 | 1.02 | 0.94 | 71.00 | 29.00 | 0.98 | 1.04 |
| Himachal Pradesh | 91.31 | 8.69 | 1.24 | 0.33 | 90.21 | 9.79 | 1.25 | 0.35 |
| Jammu &Kashmir | - | - | - | - | 75.12 | 24.88 | 1.04 | 0.90 |
| Karnataka | 73.08 | 26.92 | .94 | 1.18 | 66.02 | 33.98 | 0.91 | 1.22 |
| Kerala | 73.61 | 26.39 | 1.00 | 1.01 | 74.03 | 25.97 | 1.03 | 0.93 |
| Madhya Pradesh | 76.82 | 23.18 | 1.04 | 0.89 | 75.03 | 24.97 | 1.04 | 0.90 |
| Maharashtra | 61.31 | 38.69 | 0.83 | 1.48 | 57.60 | 42.40 | 0.80 | 1.53 |
| Manipur | 72.48 | 27.52 | 0.98 | 1.05 | 76.12 | 23.88 | 1.05 | 0.86 |
| Meghalaya | 81.40 | 18.60 | 1.10 | 0.71 | 80.37 | 19.63 | 1.11 | 0.71 |
| Mizoram | 53.90 | 46.10 | 0.73 | 1.76 | 50.50 | 49.50 | 0.70 | 1.78 |
| Nagaland | 82.79 | 17.21 | 1.12 | 0.66 | 82.26 | 17.74 | 1.14 | 0.64 |
| Orissa | 86.62 | 13.38 | 1.17 | 0.51 | 85.03 | 14.97 | 1.18 | 0.54 |
| Punjab | 70.45 | 29.55 | 0.95 | 1.13 | 66.05 | 33.95 | 0.91 | 1.22 |
| Rajasthan | 77.12 | 22.88 | 1.04 | 0.88 | 76.62 | 23.38 | 1.06 | 0.84 |
| Sikkim | 90.90 | 9.10 | 1.23 | 0.35 | 88.90 | 11.10 | 1.23 | 0.40 |
| Tamil Nadu | 65.85 | 34.15 | 0.89 | 1.31 | 56.14 | 43.86 | 0.78 | 1.58 |
| Tripura | 84.70 | 15.30 | 1.15 | 0.59 | 82.98 | 17.02 | 1.15 | 0.61 |
| Uttar Pradesh | 80.16 | 19.84 | 1.09 | 0.76 | 78.99 | 21.01 | 1.09 | 0.76 |
| West Bengal | 72.52 | 27.48 | 0.98 | 1.05 | 71.97 | 28.03 | 1.00 | 1.01 |
| **India** | **73.87** | **26.13** | **1.00** | **1.00** | **72.22** | **27.78** | **1.00** | **1.00** |

**Ratio of Non-agricultural Workers to Agricultural Workers:**

Ratio of non-agricultural workers to agricultural workers has been derived to compare the occupational dependency of population on non-agricultural sector and agricultural worker. For this purpose total agricultural population in the different states has been calculated by adding the cultivators and agricultural workers from workers categories, while non-agricultural workers has been worked out by adding manufacturing workers, workers engaged in construction, trade and commerce, transport storage and communication and other services. If the ratio of non-agricultural workers to agricultural workers is more than one indicates that workers engaged in non-agricultural sector is more than agricultural sector and vice-verse. The ratio of non-agricultural workers to agricultural workers also indicates the diversification of occupational structure in the states. The ratio of non-agricultural workers to agricultural workers has been presented in table (3.6).

It is evident from table 3.6 that among all states Kerala is the leading state where the ratio of non-agricultural workers to agricultural workers is highest. The ratio is 3.299, refers that against each agricultural worker there are three non-agricultural workers. It also denotes that Kerala has most diversified occupational structure in the country. Kerala is followed by Punjab, West Bengal and Tamil Nadu where the ratios are more than unity i.e. 1.541, 1.276 and 1.108 respectively. All the remaining states have the ratio less than one.

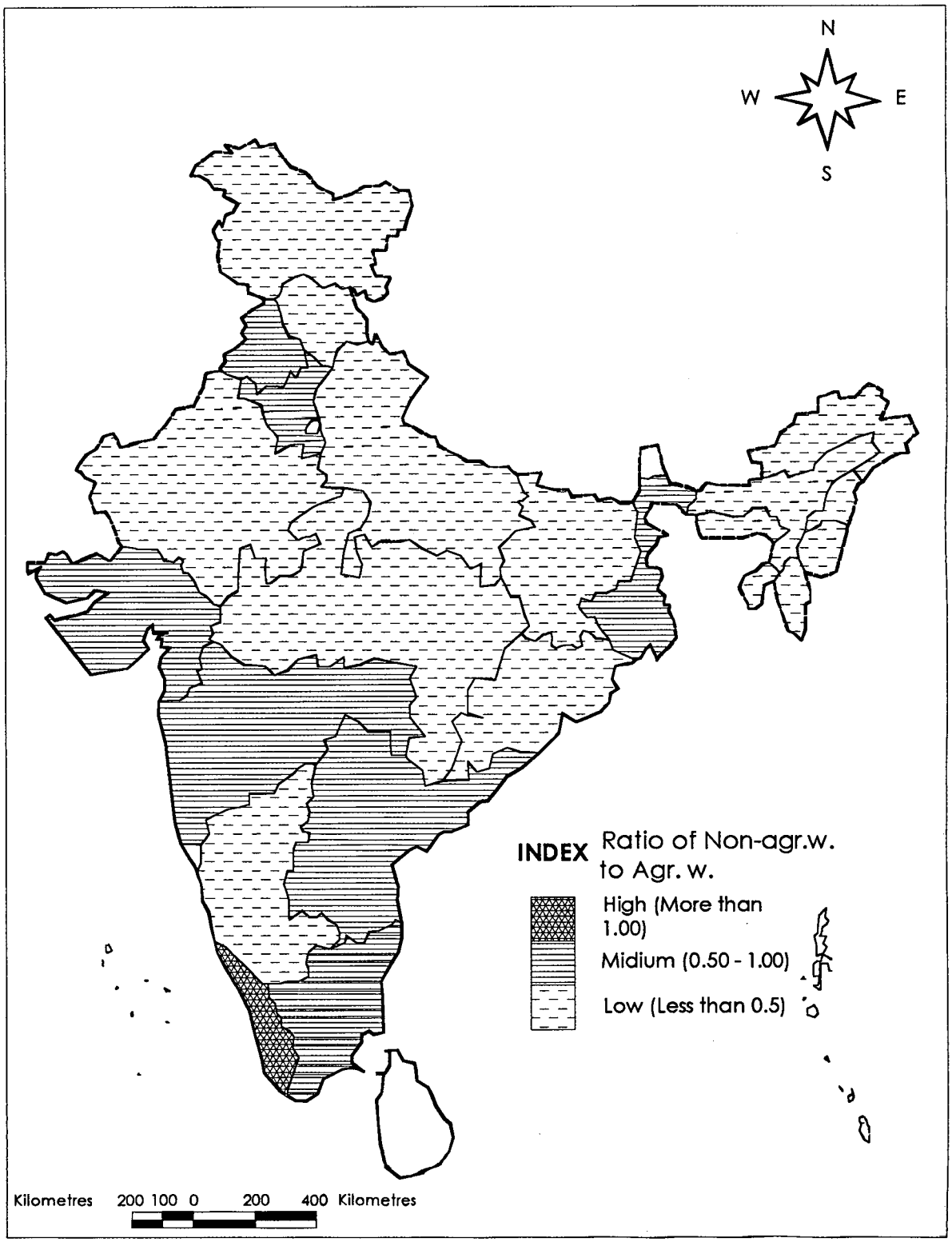
The ratio of non-agricultural workers to agricultural workers is lowest in Bihar (.341), denotes that 66 percent of working population is directly dependent on land for agriculture. Madhya Pradesh, Himachal Pradesh, Nagaland, Rajasthan and Uttar Pradesh

are the other states where ratio is very low. These states have the ratio .371, .457, .470, .515 and .524 respectively. All these states are showing a heavy pressure of population on land.

It is evident from the table (3.1) that Kerala was only one state which had more than one ratio in 1971 and registered a three times increase in the ratio during thirty years. The ratios of non-agricultural workers to agricultural workers were very low in the states of Tripura, Manipur, Andhra Pradesh, Assam, Jammu & Kashmir, Punjab, Orissa and Meghalaya in 1971 become almost double in 2001.

Fig 3.9 and 3.10 presents the ratio of non-agricultural workers to agricultural workers for the year 1971 and 2001 respectively. The ratio has been divided into three categories of high ratio (more than 1), low ratio (less than .5) and medium (.5 to 1). It is clear that Kerala was only one state in 1971, which shows high density. But In 2001 Punjab, West Bengal and Tamil Nadu added in this category. Maharashtra, Gujarat, Haryana and Andhra Pradesh reported the ratio of .5 to 1 in both the years. While Karnataka, Jammu and Kashmir, Andhra Pradesh, Orissa, Utter Pradesh, Rajasthan, Assam, Arunachal Pradesh, Meghalaya are showing medium ratio in 2001, which have low density in 1971. Nagaland, Himachal Pradesh, Madhya Pradesh and Bihar remained in the same category of low ratio in both the years. The coefficient of variation in the distribution of ratio was in 1971 was 50.87 percent in 1971 decreased continuously to 45.78 percent in 1991 and again gone up to 69.23 percent in 2001.

# FIG. 3.9
# Ratio of Non-Agricultural Workers to Agricultural Workers (1971)



# FIG. 3.10
## Ratio of Non-Agricultural Workers to Agricultural Workers (2001)

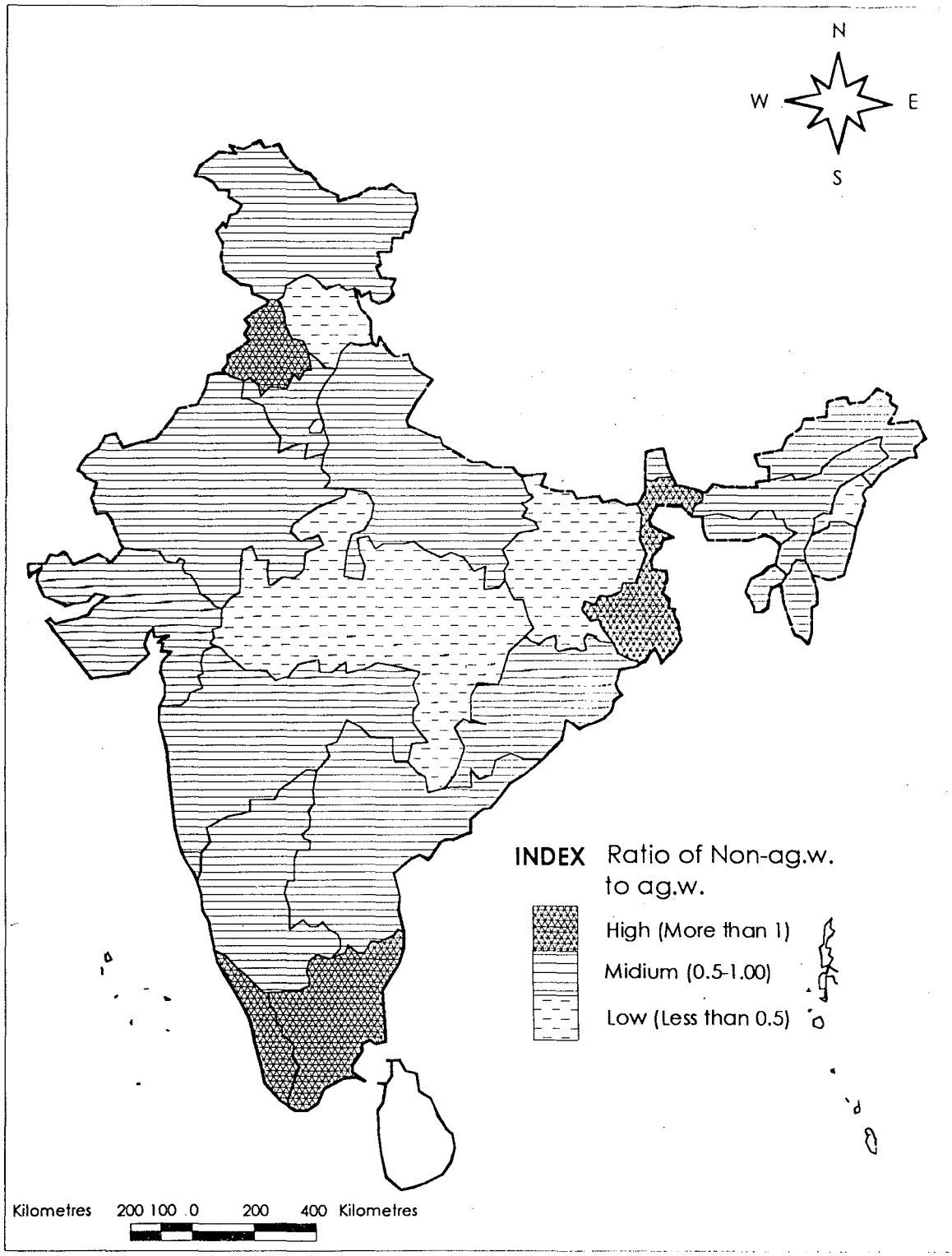


Table: 3.6

**Ratio of Non-Agricultural Workers to Agricultural Workers (1971, 1981, 1991, 2001)**

| States | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|
| Andhra Pradesh | 0.514 | 0.438 | 0.419 | 0.605 |
| Arunachal Pradesh | 0.243 | 0.355 | 0.497 | 0.605 |
| Assam | 0.364 | N.A. | 0.413 | 0.899 |
| Bihar | 0.190 | 0.265 | 0.219 | 0.341 |
| Gujarat | 0.583 | 0.663 | 0.715 | 0.921 |
| Haryana | 0.559 | 0.645 | 0.712 | 0.939 |
| Himachal Pradesh | 0.288 | 0.412 | 0.462 | 0.457 |
| Jammu & Kashmir | 0.405 | 0.657 | - | 0.996 |
| Karnataka | 0.462 | 0.595 | 0.517 | 0.789 |
| Kerala | 1.056 | 1.421 | 1.376 | 3.299 |
| Madhya Pradesh | 0.222 | 0.312 | 0.298 | 0.371 |
| Maharashtra | 0.619 | 0.619 | 0.646 | 0.805 |
| Manipur | 0.297 | 0.458 | 0.438 | 0.743 |
| Meghalaya | 0.232 | 0.378 | 0.372 | 0.518 |
| Mizoram | - | - | 0.526 | 0.673 |
| Nagaland | 0.267 | 0.368 | 0.334 | 0.470 |
| Orissa | 0.235 | 0.339 | 0.331 | 0.545 |
| Punjab | 0.659 | 0.723 | 0.795 | 1.541 |
| Rajasthan | 0.304 | 0.451 | 0.412 | 0.515 |
| Sikkim | - | 0.577 | 0.481 | 0.775 |
| Tamil Nadu | 0.640 | 0.641 | 0.642 | 1.018 |
| Tripura | 0.325 | 0.486 | 0.584 | 0.964 |
| Uttar Pradesh | 0.312 | 0.342 | 0.374 | 0.524 |
| West Bengal | 0.794 | 1.172 | 0.821 | 1.276 |
| **Mean** | **0.423** | **0.545** | **0.526** | **0.858** |
| **S.D.** | **0.215** | **0.255** | **0.241** | **0.594** |
| **C.V.** | **50.877** | **46.733** | **45.783** | **69.235** |

**Conclusion:**

It is observed from the above analysis that Bihar, Himachal Pradesh, West Bengal, Uttar Pradesh, Tamil Nadu, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland and Tripura emerges as the states where the pressure of population on agricultural land are high as their agricultural density is comparatively higher. In terms of Physiological density Bihar, Himachal Pradesh, West Bengal, Uttar Pradesh Tamil Nadu, Jammu & Kashmir, Manipur and Tripura again emerges as the states of high densely populated states. Similarly concentration of rural population was found to be higher in Bihar, Himachal Pradesh, Nagaland, Assam, Tripura and Orissa as the location quotient are found to more than unity. These all states except west Bengal (which is highly industrialized state) have less than one ratio of non-agricultural workers to agricultural workers. It is interesting to note that Kerala very, which has high rural and physiological density, has very low agricultural density and very high ratio of non-agricultural workers to agricultural workers (ratio is more than one). It signifies that Kerala is highly ruraly-populated state but has diversified occupational structure. Punjab and Haryana, which denotes high rural density has adversely low agricultural density, signifies higher opportunity of land under plough.

In the case of changes occurred in pressure of population, it is observed that almost all the states, except some exception, have increase in the agricultural density. But the most profound change has been seen in Manipur, Bihar and Himachal Pradesh, Madhya Pradesh and Rajasthan where agricultural density has been found to increase almost double during last thirty years. Similarly Physiological Density is seen to be growing rapidly in Bihar, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Manipur

and Rajasthan. The ratio of non-agricultural workers to agricultural workers is seen to be rising rapidly in the states where ratio is already very low but Bihar, Himachal Pradesh, Madhya Pradesh and Nagaland is seems to be indifferent in this case, where ratio is still very low.

# Interrelation between Population Pressure and Land Use Pattern

## Chapter Four

# CHAPTER 4

## Interrelation between Population Pressure and Land Use Pattern

### Introduction:

In the previous two chapters, pattern and changes in land use and changes in demographic and economic variables have already been discussed. It is further useful to examine the relationships between these two sets of variables and to assess the determinants of land use changes. An attempt, therefore, is made in this chapter to examine the nature and direction of causal association between the two.

To identify the relationship between land use pattern and individual demographic and economic variables, Pearson correlation coefficient has been worked out. For assessing the demographic and economic determinants of land use, particularly net area sown, stepwise regression analysis has been used. Here it is assumed that land use pattern is function of demographic and economic variables. List of variables taken in the present study is as follows.

Demographic and Economic Variables:

1. AGD- Agricultural Density.
2. CPD- Crude Population Density.
3. PPC- Percentage Population Concentration.
4. URB- Urbanisation.
5. RNAGTAG- Ratio of Non-agricultural Workers to Agricultural Workers.

Land Use Categories:

6. FOR- Forest Land
7. NAG- Area under Non-Agricultural Uses.
8. BUNCL- Barren and Uncultivable Land.
9. PPGL- Permanent Pasture Grazing Land.

10. MTCG- Miscellaneous Tree Crops and Groves.

11. CW- Culturable Waste Land.

12. OTCF- Other Than Current Fallows.

13. CF- Current Fallows.

14. FL- Fallow Land.

15. NSA- Net Sown Area.

16. ASMTO- Area Sown More Than Once.

**Relationship between Different Land Use Categories:**

At the beginning it will be useful to see the relationship among different land use categories. For this purpose, correlation coefficient has been worked out for different points of times i.e. 1971,1981,1991,1999 and are given in table 4.1, 4.2, 4.3, 4.4 respectively.

It is revealed from the tables that net area sown is negatively correlated with forestland, barren land, permanent pasture and land under miscellaneous tree. The significant negative association exists between net area sown and forest land for all the years taken for the study (at less than 1 percent level of significance), implies that the states which have higher proportion of total reported area as net sown area are characterised with lower proportion as forest land. Similarly net sown area is significantly associated (at 5 percent level of significance) with barren land, meaning thereby that the area with higher percentage share as net sown area of total reported area is characterised with lower proportion of area under barren land.

Area put to non-agricultural uses has a significant negative correlation with culturable wasteland. It indicates where land under non-agricultural uses are higher in percentage have lower percentage share as culturable wasteland. This relationship stands true for 1981, 1991 and 1999. This relationship indicates that wasteland has been

encroached for non-agricultural purposes due to increase in demands of land for roads, railways, settlements etc.

Culturable wasteland has a significant positive correlation, at 5 percent level of significance, with fallow land other than current fallow in 1971 and at less than 1 percent level of significance in 1999. Similarly other than current fallows is showing a highly positive association with current fallow (significant at five percent level of significance in 1971,1991 and 1999). It implies that states with higher proportion of land as culturable wasteland characterised with an equally higher proportion of total reported area as fallow land other than current fallows. Similarly higher proportion of land as other than current fallow is characteristics of higher proportion of land as current fallows. It seems that culturable wasteland has its origin mainly from other than current fallows and other than current fallows have its origin from current fallows.

Table 4.1: Correlation Matrix of Land Use Pattern (1970-71)

| | FOR | NAG | BUNCL | PPGL | MTCG | CW | OTCF | CF | NAS |
|---|---|---|---|---|---|---|---|---|---|
| FOREST | 1.000 | | | | | | | | |
| | . | | | | | | | | |
| N.AG | -.182 | 1.000 | | | | | | | |
| | (.470) | . | | | | | | | |
| BUNCL | -.219 | -.378 | 1.000 | | | | | | |
| | (.341) | (.122) | . | | | | | | |
| PPGL | .404 | -.502* | -.063 | 1.000 | | | | | |
| | (.108) | (.040) | (.811) | . | | | | | |
| MTCG | .406 | .105 | -.139 | (-.211) | 1.000 | | | | |
| | (.084) | (.678) | (.571) | (.417) | . | | | | |
| CW | -.254 | -.242 | .270 | .092 | -.299 | 1.000 | | | |
| | (.324) | (.348) | (.294) | (.725) | (.244) | . | | | |
| OTCF | -.778** | .097 | .320 | -.247 | -.360 | .596* | 1.000 | | |
| | (.000) | (.732) | (.226) | (.375) | (.171) | (.019) | | | |
| CF | -.483* | .406 | .094 | -.239 | -.388 | .187 | .703** | 1.000 | |
| | (.049) | (.106) | (.721) | (.356) | (.123) | (.473) | (.003) | . | |
| NAS | -.583* | .321 | -.602** | -.539* | -.155 | -.095 | .554* | .262 | 1.000 |
| | (.006) | (.194) | (.004) | (.026) | (.527) | (.717) | (.030) | (.311) | . |

Table 4.2: Correlation Matrix of Land Use Pattern (1980-81)

| | FOR | N.AG | BUNCL | PPGL | MTCG | CW | OTCF | CF | NAS |
|---|---|---|---|---|---|---|---|---|---|
| FOR | 1.000 | | | | | | | | |
| | . | | | | | | | | |
| N.AG | -.104 | 1.000 | | | | | | | |
| | (.644) | . | | | | | | | |
| BUNCL | .151 | -.378 | 1.000 | | | | | | |
| | (.524) | (.100) | . | | | | | | |
| PPGL | .164 | -.315 | .226 | 1.000 | | | | | |
| | (.502) | (.190) | (.353) | . | | | | | |
| MTCG | .585** | .193 | -.064 | -.199 | 1.000 | | | | |
| | (.005) | (.402) | (.794) | (.427) | . | | | | |
| CW | -.125 | -.436* | .118 | .085 | .032 | 1.000 | | | |
| | (.588) | (.048) | (.631) | (.728) | (.894) | . | | | |
| OTCF | -.068 | -.271 | .253 | -.246 | .217 | .182 | 1.000 | | |
| | (.789) | (.277) | (.345) | (.358) | (.388) | (.470) | | | |
| CF | -.304 | .180 | -.032 | -.149 | -.213 | -.036 | .264 | 1.000 | |
| | (.192) | (.447) | (.900) | (.555) | (.382) | (.882) | (.264) | . | |
| NAS | -.698** | .319 | -.575* | -.447* | -.431* | -.282 | -.428 | -.028 | 1.000 |
| | (.000) | (.148) | (.008) | (.055) | (.051) | (.216) | (.076) | (.906) | . |

** Correlation is significant at the 0.01 level, (2-tailed).
*Correlation is significant at the 0.05 level, (2-tailed).

Table 4.3: Correlation Matrix of Land Use Pattern (1990-91)

| | FOR | NAG | BUNCL | PPGL | MTCG | CW | CF | NAS |
|---|---|---|---|---|---|---|---|---|
| FOR | 1.000 | | | | | | | |
| | . | | | | | | | |
| NAG | -.261 | 1.000 | | | | | | |
| | (.218) | . | | | | | | |
| BUNCL | .120 | -.216 | 1.000 | | | | | |
| | (.594) | (.334) | . | | | | | |
| PPGL | .122 | -.143 | .153 | 1.000 | | | | |
| | (.608) | (.546) | (.520) | . | | | | |
| MTCG | .493* | -.154 | -.039 | .072 | 1.000 | | | |
| | (.014) | (.472) | (.862) | (.763) | . | | | |
| CW | .025 | -.417* | -.058 | -.036 | .160 | 1.000 | | |
| | (.911) | (.048) | (.802) | (.879) | (.466) | . | | |
| FLOTCF | .225 | -.361 | -.041 | -.268 | .197 | .352 | | |
| | (.328) | (.108) | (.869) | (.281) | (.392) | (.118) | | |
| CF | -.123 | -.037 | -.161 | -.303 | -.050 | .061 | 1.000 | |
| | (.586) | (.871) | (.498) | (.208) | (.821) | (.787) | . | |
| NAS | -.797** | .284 | -.504* | -.387 | -.418* | -.236 | -.035 | 1.000 |
| | (.000) | (.178) | (.017) | (.092) | (.042) | (.277) | (.876) | . |

Table 4.4: Correlation Matrix of Land Use Pattern (1998-99)

| | FOR | N.AG | BUNCL | PPGL | MTCG | CW | OTCF | CF | NAS |
|---|---|---|---|---|---|---|---|---|---|
| FOR | 1.000 | | | | | | | | |
| | . | | | | | | | | |
| N.AG | -.045 | 1.000 | | | | | | | |
| | (.842) | . | | | | | | | |
| BUNCL | .029 | -.278 | 1.000 | | | | | | |
| | (.900) | (.235) | . | | | | | | |
| PPGL | -.063 | -.152 | .618** | 1.000 | | | | | |
| | (.787) | (.522) | (.004) | . | | | | | |
| MTCG | .391* | -.122 | -.033 | -.124 | 1.000 | | | | |
| | (.065) | (.587) | (.888) | (.593) | . | | | | |
| CW | .101 | -.414 | -.040 | -.099 | .280 | 1.000 | | | |
| | (.656) | (.062) | (.867) | (.670) | (.207) | . | | | |
| OTCF | .174 | .066 | -.295 | -.253 | .285 | .541** | 1.000 | | |
| | (.427) | (.769) | (.193) | (.268) | (.188) | (.009) | . | | |
| CF | -.363 | .220 | -.342 | -.217 | .142 | .105 | .551** | 1.000 | |
| | (.088) | (.325) | (.129) | (.344) | (.519) | (.641) | (.006) | . | |
| NAS | -.747** | .080 | -.502* | -.330 | -.408* | -.309 | -.252 | .232 | 1.000 |
| | (.000) | (.724) | (.020) | (.144) | (.050) | (.161) | (.246) | (.287) | . |

* Correlation is significant at the 0.05 level, (2-tailed).
** Correlation is significant at the 0.01 level, (2-tailed).

**Correlation between demographic and economic variables with land use:**

The correlation coefficient has been worked out to assess the relationship between individuals of demographic and economic variables and land use pattern. The correlation coefficient among demographic and economic variables and land use pattern has been worked out for four points of times and is given in tables 4.5, 4.6, 4.7, and 4.8 respectively.

1971:

It is evident from table 4.5 that agricultural density is negatively correlated with urbanisation, suggesting that agricultural density is lesser where urbanisation is higher. Crude population density is significantly and highly positively correlated with ratio of non-agricultural workers to agricultural workers, indicates that population density is higher in those states where ratio of non-agricultural workers to agricultural is comparatively higher. Similarly urbanisation is significantly associated with ratio of non-

agricultural workers to total agricultural workers. It indicates that the states where percentage of urbanisation is higher, are characterised with equally higher ratio of non-agricultural workers to agricultural workers.

A higher pressure of population over land generally causes transfer of land to building houses or roads etc., so the area put to non agricultural uses is expected to be positively associated with population density. A higher density of population necessitates the occurrence of larger proportion of total reported area under cultivation so the cultivable land should be expected to be positively associated with population density. Consequently forest area, culturable wasteland and fallow land exhibit negative association.

Table 4.5: Correlates of demographic and economic variables with land use (1971)

| | AGD | CPD | PPC | URBANIS | RNAGTAG |
|---|---|---|---|---|---|
| AGD | 1.000 | -.031 | -.237 | -.470* | -.237 |
| | . | .892 | .301 | .032 | .302 |
| CPD | -.031 | 1.000 | .464* | .265 | .735** |
| | .892 | . | .034 | .246 | .000 |
| PPC | -.237 | .464* | 1.000 | .318 | .105 |
| | .301 | .034 | . | .160 | .649 |
| URB | -.470* | .265 | .318 | 1.000 | .611** |
| | .032 | .246 | .160 | . | .003 |
| RNAGTAG | -.237 | .735** | .105 | .611** | 1.000 |
| | .302 | .000 | .649 | .003 | . |
| FOR | .311 | -.263 | -.313 | -.452* | -.250 |
| | .170 | .249 | .168 | .040 | .273 |
| NAGL | .252 | .586* | .236 | -.008 | .211 |
| | .313 | .011 | .345 | .974 | .401 |
| CW | -.327 | -.306 | .138 | -.010 | -.288 |
| | .201 | .232 | .596 | .971 | .263 |
| FL | -.055 | -.004 | .519* | .299 | -.183 |
| | .828 | .989 | .027 | .228 | .466 |
| NSA | -.684* | .639** | .525* | .551* | .581** |
| | .001 | .002 | .015 | .010 | .006 |
| ASMTO | .186 | .322 | -.092 | -.331 | .123 |
| | .419 | .155 | .693 | .143 | .595 |

It is noticed that net sown area has a strong positive correlation with four variables i.e. crude population density, percentage concentration of population, urbanisation and ratio of non-agricultural workers to agricultural workers. The correlation is significant at 1 percent level of significance for crude population density and ratio of non-agricultural workers to agricultural workers and at 5 percent level of significance for percentage population concentration and urbanisation. The strong correlation between and net sown area and population density implies that states with higher pressure on land are characterised with an equally higher proportion of total reported area as net sown area. Similarly significant positive relationship of percentage population concentration with net area sown, indicates that the states where population concentration is higher have higher percentage of share as net sown area. It is interesting to note that net sown area has a positive relationship with urbanisation and ratio of non-agricultural workers to total agricultural workers. This relationship suggesting that the states, where urbanisation is higher and have more workers are engaged in non-primary sector than agricultural sector have more land for land for cultivation. There exist a negative relationship between net area sown and agriculture density (the correlation coefficient is significant at 1 percent level of significance). It seems that with higher growth in rural population with limited scope of expansion in cultivated area, the agriculture density has increased more rapidly in the densely populated rural areas.

Another important point that emerges from the table 4.5 is the negative association of forestland with urbanisation. This inverse relationship shows that urbanisation and land under forest cover are going in opposite direction.

Area put to non-agricultural uses is positively associated with population density. The relationship is significant at 1 percent level of significance, reveals the fact that the area occupied for non-agricultural uses is increasing with the increase in

population pressure. Fallow land exhibit a positive association with population concentration, indicates that population concentration has a causal relationship with fallow land.

**1981:**

Table 4.6 given below shows the coefficient of correlation among different variables taken for the study for the year 1981. It is noticed from the table that crude population density again shows a significant positive correlation with population concentration and with ratio of non-agricultural workers to agricultural workers (significant at 5 percent level of significance). Similarly it again found to have a significant positive association between urbanisation and ratio of non-agricultural workers to agricultural workers as it was seen in 1971. The explanation has been given earlier for these associations.

Net area sown again shows a positive significant association with crude population density, percentage population concentration, urbanisation and ratio of non-agricultural workers to agricultural workers. The correlation is significant at 1 percent in the case of crude population density and at 5 percent level of significant in the case of population concentration, urbanisation and ratio of non-agricultural workers to agricultural workers. It again found that net sown area has a negative association with agricultural density. Correlation coefficient is significant at 1 percent level of significance.

Some new result emerges from 4.6 is that forestland shows a significant negative correlation with crude population density, population concentration and ratio of non-agricultural workers to total agricultural workers. It is also found that land under forest cover has a significant negative correlation with urbanisation as it is seen in 1971. The correlation is significant at 5 percent level of significance for all four variables. It seems

here that not only urbanisation but also other factors like population density and population concentration are determinant of forest cover. Land put to non-agricultural uses is again showing positive association with population density (table 4.6).

Table 4.6: Correlates of demographic and economic variables with land use (1981)

| | AGD | CPD | PPC | URB | RNAGTAG |
|---|---|---|---|---|---|
| AGD | 1.000 | -.047 | -.173 | -.238 | -.273 |
| | . | .841 | .452 | .298 | .230 |
| CPD | -.047 | 1.000 | .486* | .165 | .621** |
| | .841 | . | .022 | .464 | .003 |
| PPC | -.173 | .486* | 1.000 | .274 | -.034 |
| | .452 | .022 | . | .217 | .885 |
| URB | -.238 | .165 | .274 | 1.000 | .407* |
| | .298 | .464 | .217 | . | .067 |
| RNAGTAG | -.273 | .621** | -.034 | .407* | 1.000 |
| | .230 | .003 | .885 | .067 | . |
| FOR | .354 | -.378 | -.410* | -.468* | -.186 |
| | .116 | .082 | .058 | .028 | .420 |
| NAG | .080 | .625** | .227 | -.047 | .304 |
| | .730 | .002 | .310 | .836 | .180 |
| CW | .062 | -.323 | -.103 | .030 | -.196 |
| | .796 | .153 | .657 | .897 | .409 |
| FL | .308 | -.253 | -.109 | .050 | -.285 |
| | .229 | .310 | .667 | .844 | .268 |
| NAS | -.626** | .657** | .517* | .414* | .400 |
| | .002 | .001 | .014 | .055 | .072 |
| ASMTO | .265 | .209 | -.167 | -.306 | -.051 |
| | .246 | .352 | .458 | .166 | .827 |

**1991:**

It is noticed from table 4.7 that crude population density again has a significant positive correlation with percentage population concentration. Similarly urbanisation again found to be significantly associated with ratio of non-agricultural workers to agricultural workers.

Net sown area again exhibits a significant positive association with crude population density and percentage population concentration and significant negative correlation with agricultural density. The correlations are significant at 1 percent level of

significance. But the association of net sown area with urbanisation and with ratio of non-agricultural workers to agricultural workers is weakened in this decade.

Table 4.7: Correlates of demographic and economic variables with land use (1991)

| | AGD | CPD | PPC | URB | RNAGTAG |
|---|---|---|---|---|---|
| AGD | 1.000 | -.077 | -.088 | -.050 | -.331 |
| | . | .727 | .690 | .820 | .123 |
| CPD | -.077 | 1.000 | .522** | .077 | .316 |
| | .727 | . | .009 | .722 | .141 |
| PPC | -.088 | .522** | 1.000 | .061 | -.034 |
| | .690 | .009 | . | .776 | .879 |
| URB | -.050 | .077 | .061 | 1.000 | .487 |
| | .820 | .722 | .776 | . | .019 |
| RNAGTAG | -.331 | .316 | -.034 | .487* | 1.000 |
| | .123 | .141 | .879 | .019 | . |
| FOR | .422* | -.502* | -.458* | -.065 | -.079 |
| | .045 | .012 | .025 | .764 | .721 |
| NAG | -.008 | .604** | .286 | -.303 | .011 |
| | .971 | .002 | .176 | .150 | .962 |
| CW | -.164 | -.255 | -.112 | .231 | .484* |
| | .465 | .240 | .610 | .288 | .023 |
| FL | .594** | -.125 | .183 | .395 | -.310 |
| | .005 | .579 | .414 | .069 | .172 |
| NAS | -.608** | .678*8 | .497* | .159 | .172 |
| | .002 | .000 | .014 | .457 | .433 |
| ASMTO | -.072 | .275 | -.104 | -.453* | -.092 |
| | .744 | .193 | .630 | .026 | .675 |

It is evident that forestland again shows a significant negative correlation with crude population density and population concentration. The correlations are significant at 5 percent level of significance. Culturable wasteland shows a significant positive correlation (significant at 5 percent level of significance) with ratio of non-agricultural workers to agricultural workers, indicates that culturable wasteland is comparatively higher where non-agricultural workers (It indicates urbanisation and industrialisation) are similarly higher in ratio to agricultural workers.

**2001:**

Correlation among different variables is presented in table 4.8 for the year 2001. More or less similar result is found as it is observed in previous decades. Crude population density is again positively correlated with population concentration and ratio of non-agricultural workers to agricultural workers. The correlations are significant at 5 percent level of significant.

Table 4.8: Correlates of demographic and economic variables with land use (2001)

| | AGD | CPD | PPC | URB | RNAGTAG |
|---|---|---|---|---|---|
| AGD | 1.000 | -.164 | -.100 | -.304 | -.360 |
| | . | .456 | .649 | .158 | .092 |
| CPD | -.164 | 1.000 | .528* | .071 | .571** |
| | .456 | . | .010 | .748 | .004 |
| PPC | -.100 | .528* | 1.000 | .109 | -.141 |
| | .649 | .010 | . | .622 | .520 |
| URB | -.304 | .071 | .109 | 1.000 | .207 |
| | .158 | .748 | .622 | . | .343 |
| RNAGTAG | -.360 | .571* | -.141 | .207 | 1.000 |
| | .092 | .004 | .520 | .343 | . |
| FOR | .286 | -.503* | -.487* | -.063 | -.110 |
| | .186 | .014 | .018 | .777 | .618 |
| NAG | .076 | .532* | .244 | -.135 | .110 |
| | .736 | .011 | .273 | .548 | .626 |
| CW | .042 | -.407* | -.132 | .123 | -.254 |
| | .854 | .060 | .559 | .587 | .254 |
| FL | .279 | -.034 | .325 | .173 | -.354 |
| | .208 | .881 | .140 | .441 | .106 |
| NAS | -.631** | .701** | .519* | .300 | .366 |
| | .001 | .000 | .011 | .164 | .086 |
| ASMTO | .095 | .317 | -.054 | -.314 | .139 |
| | .666 | .141 | .807 | .144 | .526 |

Net sown area again found to be significantly associated with agricultural density, crude population density and population concentration. Forestland found to be negatively correlated with crude population density and population concentration (significant at 5 percent level of significance). Area put to non-agricultural uses is again significantly and positively correlated with crude population density. Cultivable wasteland is noticed to be negatively associated with crude population density.

**Regression Analysis:**

Taking net sown area as dependent variable the stepwise regression analysis has been worked out. The following variables have been taken as independent variable.

1. Agricultural density.
2. Percentage population concentration.
3. Urbanisation.
4. Ratio of non-agricultural workers to agricultural workers.

Determinants of Net Sown Area (1971):

Step1: NSA = 76.242 - .003 AGD
(4.088)**
$R^2$ = .440 F=16.715**

Step 2: NSA =50.767 - .002 AGD + 45.282 NAGWTAGW
(4.058)** (3.112)**
$R^2$ = .616 F = 17.022**

Step 3: NSA =38.281 - .002 AGD + 43.353 NAGWTAGW +1.995 PPC
(4.112)** (3.604)** (3.066)**
$R^2$ = .616 F = 19.780**

** Significant at 1 percent level.
* Significant at 5 percent level.

The result of stepwise regression analysis reveals that agricultural density is the most important determinant of net sown area, which explains 44 percent of total variation. It found to be followed by ratio of non-agricultural workers to agricultural workers and percentage population concentration. Their partial contribution to explanatory power in the three subsequent steps were 17.6 percent and 8.2 percent respectively. These three variables explained 73.8 percent of the total variation in Net sown area. Another variable

namely urbanisation has not been included in the model since the adjusted $R^2$ has starting declining after third step.

The regression coefficient is found to be significant at less than one percent for all thee variables. F values are found be constantly significant at 1 percent level of significance in all three steps.

Determinants of Net Sown Area (1981):

Step1: NSA = 70.691 - .003 AGD
(3.499)**
$R^2$ = .392 F=12.240**

Step 2: NSA =57.091 + .001 AGD + 2.226 PPC
(3.491)** (2.636)*
$R^2$ = .561 F = 11.512**

** Significant at 1 percent level.
* Significant at 5 percent level.

From the regression analysis it is observed that agricultural density again emerges as the most dominant determinant of net sown area with an explanatory power of 39.2 percent. This is followed by percentage population concentration. In the second step of regression model, explanatory power of both variables is gone up to 56.1 percent. Ratio of non-agricultural workers to total agricultural workers is not found significantly associated in 1981 and it reduces the value of $R^2$, which was seen as one of the determining variable in 1971.

The regression coefficient is significant at 1 percent in the case of agricultural density and at 5 percent in the case of population concentration. The F values are also found to be significant at 1 percent level of significance in both steps.

Determinants of Net Sown Area (1991):

Step1: NSA = 68.549 - .001 AGD
(3.510)**

$R^2$ = .370 F=12.317**

Step 2: NSA =57.158 + .001 AGD + 2.226 PPC
(3.491)** (2.859)*

$R^2$ = .553 F = 12.351**

** Significant at 1 percent level.
* Significant at 5 percent level.

The stepwise regression analysis reveals that agricultural density again emerges as the single most important determinant of net sown area, but the explanatory power has decreased from decade to decade. This is followed again by population concentration. It has raised the explanatory power by 18.3 percent in the second step of regression model. Thus the contribution of population concentration as a determinant power has increased in 1971 as compared to 1971 and 1981.

Again the analysis is confined to two steps. The regression coefficient in the case of agricultural density is found to be significant at 1 percent and at 5 percent in the case of population concentration. The F values are found to be significant at 1 percent level of significance in both steps.

Determinants of Net Sown Area (2001):

Step1: NSA = 71.136 - .001 AGD
(3.726)**

$R^2$ = .369 F=13.883**

Step 2: NSA =58.256 + .001 AGD + 2.472 PPC
(4.154)** (3.271)*

$R^2$ = .569 F = 15.498**

** Significant at 1 percent level.
* Significant at 5 percent level.

The result of stepwise regression of 2001 is more or less similar to previous decades. Agricultural density again stands one of the most important determinants followed by percentage of population concentration as it was seen in the three previous decades. Both the variables explain 56.9 percent of the total variance in net sown area. The regression coefficient is significant at 1 and 5 percent level of significance respectively. It again found that explanatory power of population concentration is enriching in its strength. It seems that rapid growth of in population in India has mainly occurred in the states where availability of net sown area is comparatively higher. The F values are significant at 1 percent level of significance in both steps.

**Conclusion:**

It is seen from the previous analysis that higher proportion as net sown area corresponds to lower proportion as forest land. Similarly net sown area net sown area of total reported area is characterised with lower proportion of area under barren land. Area put to non-agricultural uses has a significant negative correlation with culturable wasteland. This relationship indicates that wasteland has been encroached for non-agricultural purposes due to increase in demands of land for roads, railways, settlements etc. Culturable wasteland has a significant positive correlation with fallow land other than current fallow. Similarly other than current fallows is showing a highly positive association with current fallow. It indicates that culturable wasteland has its origin mainly from other than current fallows and other than current fallows have its origin from current fallows.

It is noticed that net sown area has a strong positive correlation with four variables i.e. crude population density, percentage concentration of population, urbanisation and ratio of non-agricultural workers to agricultural workers. The strong

correlation between and net sown area and population density implies that states with higher pressure on land are characterised with an equally higher proportion of total reported area as net sown area. Similarly significant positive relationship of percentage population concentration with net area sown indicates that the states where population concentration is higher have higher percentage of share as net sown area. It is interesting to note that net sown area has a positive relationship with urbanisation and ratio of non-agricultural workers to total agricultural workers. This relationship suggesting that the states, where urbanisation is higher and have more workers are engaged in non-primary sector than agricultural sector have more land for land for cultivation. There exist a negative relationship between net area sown and agriculture density. It seems that higher growth in rural population with limited scope of expansion in cultivated area, the agriculture density has increased more rapidly in the densely populated rural areas. The negative association of forestland with urbanisation indicates that urbanisation and land under forest cover is going in opposite direction. Area put to non-agricultural uses is positively associated with population density, reveals the fact that the area occupied for non-agricultural uses is increasing with the increase in population pressure. Fallow land exhibits a positive association with population concentration, indicates that population concentration has a causal relationship with fallow land. The result of stepwise regression analysis reveals that agricultural density is the most important determinant of net sown area. It is found to be followed by ratio of non-agricultural workers to agricultural workers and percentage population concentration.

# Conclusion

# Chapter Five

# CHAPTER 5

## Conclusion

The Present study has attempted to investigate the nature of relationship between population and land use pattern in India during the period of three decades from 1971 to 2001. The Major findings of the study are being summarized below.

It can be concluded from the above analysis that at the country level there has been an increase in the area under forest, land under non-agriculture use, permanent pasture and other grazing land, current fallow and net area sown. This has led to a decline in the barren and unculturable land, land under miscellaneous tree crops and groves, culturable wasteland and fallow land. These transformations in the land use pattern were largely in response to increase in urbanisation, industrialization and due to increase in demand for food grains and agricultural raw material. The demand of food can partly met through the extension of area under cultivation and partly through intensification of cropping by increasing multiple cropped area. At the country level both fallow land and other than current fallow has tended to increase in their area, while culturable wasteland has shown still negative growth. Net area sown after 1970-71 remained more or less constant implies that the reclaimed in culturable land has been nullified by an increase in current fallow and other than current fallows.

Most of the states of hilly terrain are prosperous in forest cover. Thicker growth of natural vegetation in these states is attributed to the existing conditions of hot-wet climate and predominance of rough terrains that are least accessible for human exploitation. Orissa and Madhya Pradesh are the two states close to the national norm,

with one-third of their reporting area under forests and fulfill the norms of forest cover required for ecological balance set in national forest policy 1952. While at the other hand the states lies within Indo-Gangatic plains whist is amongst the fertile tracts of India have extremely low land under forest cover. The states Orissa, Madhya Pradesh, Kerala, Uttar Pradesh, Bihar, Tamil Nadu, Karnataka, West Bengal, Gujarat, Rajasthan, Punjab and Haryana recorded increase in area under forest cover during the study period. Normally, with the process of development we find decline in the forest cover. This is difficult to explain in precise terms; however, tentatively it may be attributed to successful implementation of government programmes of afforestation.

The proportion of land under non-agricultural uses is very high in two highly urbanized and industrialized states of West Bengal, Tamil Nadu followed by Bihar, Assam, Goa, Assam, Tripura and Sikkim. All the states in general recorded steady increase in area put to non-agricultural uses but the states of Maharashtra, Gujarat, and Bihar reported substantial increase during the last three decades. There is ample evidence and generally accepted fact that the states of Maharashtra and Gujarat have been experiencing higher share of India's industrialization and consequent urbanization coupled with increase in physical infrastructure. Therefore, the increase of area under the non-agricultural uses hardly needs any more explanation. As far as other states including Bihar is concerned, the trend of increase can be attributed to the population growth in general and consequent social change in respect of family size specially tendency towards single family. More the division of families more the requirement of land for housing purposes.

It is found that the states with high population density and consequently high share of land under cultivation have low percentage share under Barren land. While the states with rugged topography and predominance of salt marshes and flooded area have very high share under this category. Almost all the states reported decline in the share under Barren and Uncultivable land. It means that the barren land is being encroached for other than agricultural purposes.

Among all the states Himachal Pradesh has been found to have extremely high percentage followed by Madhya Pradesh, Karnataka and Rajasthan under permanent pasture and grazing land. All the states except Uttar Pradesh and Himachal Pradesh reported decline in the share under this category. The most profound change has been seen in the states of Arunachal Pradesh, Himachal Pradesh, Orissa, Bihar, Haryana and Rajasthan.

Unscientific method of cultivation and other similar farm practices may make earlier cultivated area abandoned due to unsuitability of the same on account of soil deficiencies. The states of Meghalaya, Mizoram, Rajasthan and Gujarat have very high percentage of land of the total reported area under culturable wasteland, while at the other hand Haryana, Punjab and West Bengal has very less percentage of land under this category. The decrease is observed in all states except Gujarat in culturable wasteland, which conversely showed positive growth. Punjab and Assam reported very significant decline in this category.

It is observed that most of the states with high rural population density and having intensified cropping pattern have a little share of land as other than current fallow of the total reported area. The states of Haryana, Punjab, Gujarat, West Bengal, Jammu and

Kashmir, Himachal Pradesh, Andhra Pradesh, Kerala, Tripura and Arunachal Pradesh have very less land under other than current fallows. On the other hand, some states namely Tamil Nadu Andhra Pradesh, Bihar, Meghalaya and Mizoram reported very high share of their reporting area lying fallow land other than current fallows. Gujarat, Assam, Karnataka and Madhya Pradesh have sown negative growth in the case of other than current fallow land. The three states of Madhya Pradesh, Rajasthan and Bihar have registered no significant change in land under other than current fallow. On the other hand Orissa, Tamil Nadu, Andhra Pradesh, Maharashtra and Uttar Pradesh have shown positive growth.

The states of Punjab, Sikkim, Arunachal Pradesh, Tripura, Manipur, and Mizoram have very less amount of land under Current Fallows. Punjab, which is characterized with the highest intensification of cropping and having the highest percentage share under cultivated land among all the states, have the lowest share under this category. The states of north-eastern region of India which, have very less opportunity of land for ploughing, are showing similarly very low percentage share, indicating the maximum utilization of land for crop production land under this category. On the other hand Bihar, Andhra Pradesh, Tamil Nadu, Karnataka and Rajasthan have very high share of their reporting area under this category. Only three states namely Punjab, Orissa, and Gujarat have shown negative change. The three states of Haryana, Madhya Pradesh and Tamil Nadu have registered no significant change. On the other hand the remaining states have sown positive growth in current fallow.

The states Punjab and Haryana have an extremely high share of more than 80 percent under the net area sown. West Bengal is another one which occupies the third

rank with 63 % of total reported area as net sown area. In the states of Uttar Pradesh, Maharashtra, Kerala, Karnataka, Gujarat, Bihar, Tamil Nadu, Rajasthan, Andhra Pradesh and Madhya Pradesh net area sown varies between 40 to 60 percent. Orissa, Assam and Tripura have net sown area between 20 to 40 percent. The states of Jammu & Kashmir, Himachal Pradesh, Meghalaya, Manipur, Nagaland, and Arunachal Pradesh have very low percentage as net sown area i.e. less than 20 percent of total reported area. The trend of net area sown in majority of the states is showing very little or no increase except some of the North-Eastern states which had experienced a substantial increase. The net area sown in India has ceased to increase in general after 1970s. Since, smaller North-Eastern states had traditional very less percentage of net sown area; under recent increasing pressure on land they have shown a rapid increase and they had unlike, bigger agricultural states, the scope too to increase it.

The spatial pattern of distribution of multiple cropped areas, reveals a wide range of variation from one state to another in the extent of intensification of ploughing. In fact the intensification of farming depends, to a large extent, on such factors as physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. In the three states of Punjab, Haryana and West Bengal, intensification of cropping is very high i.e. more than 70 percent. Among these Punjab tops the list of all states in India with 91.53 percent of net sown area. This trend in Haryana and Punjab hardly needs explanation as these are the celebrated green revolution states, while, West Bengal owe its intensification to subsistence nature of agriculture better called 'oriental agriculture' where pressure on land is tremendous. People, there cannot afford to have fallow land. While, Meghalaya, Tamil Nadu, Karnataka, Gujarat, Nagaland and

Mizoram have very less intensification of cropping i.e. less than 20 percent. The factors mentioned earlier like, physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. are responsible behind the dismal performance in these states. One or more of these factors are constantly keeping the intensity very low. The changes in area sown more than once indicate that, while most of states have achieved positive growth except some exception.

It is observed that most of the states with high rural population density and having intensified cropping pattern have a little share of land as other than current fallow of the total reported area. The states of Haryana, Punjab, Gujarat, West Bengal, Jammu and Kashmir, Himachal Pradesh, Andhra Pradesh, Kerala, Tripura and Arunachal Pradesh have less land under other than current fallows i.e. less than 1 percent of the total reported area. On the other hand, some states namely Tamil Nadu Andhra Pradesh, Bihar, Meghalaya and Mizoram reported very high share more than 5 percent of their reporting area lying fallow land other than current fallows.

Gujarat, Assam, Karnataka and Madhya Pradesh have sown negative growth in the case of other than current fallow land. The three states of Madhya Pradesh, Rajasthan and Bihar have registered no significant change in land under other than current fallow. On the other hand Orissa, Tamil Nadu, Andhra Pradesh, Maharashtra and Uttar Pradesh have shown positive growth.

The states of Punjab, Sikkim, Arunachal Pradesh, Tripura, Manipur, and Mizoram have very less amount of land under Current Fallow i.e. less than 1 percent of total reported area. Punjab, which is characterized with the highest intensification of cropping and having the highest percentage share under cultivated land among all

the states, have the lowest share under this category. The states of north-eastern region of India which, have very less opportunity of land for ploughing, are showing similarly very low percentage share, indicating the maximum utilization of land for crop production. Madhya Pradesh, Kerala and Assam have less than 2 percent land under this category. On the other hand Bihar, Andhra Pradesh, Tamil Nadu, Karnataka and Rajasthan have very high share (6 to 11 percent) of their reporting area under this category. The remaining states have a share of 3 to 4 percent under this category.

Only three states namely Punjab, Orissa, and Gujarat have shown negative change. The three states of Haryana, Madhya Pradesh and Tamil Nadu have registered no significant change. On the other hand remaining nine states of Kerala, Karnataka, Rajasthan, Maharashtra, Andhra Pradesh, Assam and Uttar Pradesh have sown positive growth in current fallow.

The states Punjab and Haryana have an extremely high share of more than 80 percent under the net area sown. West Bengal is another one which occupies the third rank with 63 % of total reported area as net sown area. In the states of Uttar Pradesh, Maharashtra, Kerala, Karnataka, Gujarat, Bihar, Tamil Nadu, Rajasthan, Andhra Pradesh and Madhya Pradesh net area sown varies between 40 to 60 percent. Orissa, Assam and Tripura have net sown area between 20 to 40 percent. The states of Jammu & Kashmir, Himachal Pradesh, Meghalaya, Manipur, Nagaland, and Arunachal Pradesh have very low percentage as net sown area i.e. less than 20 percent of total reported area.

The trend of net area sown in majority of the states is showing very little or no increase except some of the North-Eastern states viz. Nagaland, Arunachal Pradesh,

Meghalaya, Assam, and Tripura, which experienced a substantial increase. These states had 4.44, 2.04, 7.25, 28.9, and 22.9 percent respectively, under the net area sown in 1970-71 while these figure increased to 16.73, 3.37, 9.86, 34.41, and 26.41 respectively in 1998-99. The net area sown in India has ceased to increase in general after 1970s. Since, smaller North-Eastern states had traditional very less percentage of net sown area; under recent increasing pressure on land they have shown a rapid increase and they had unlike, bigger agricultural states, the scope too to increase it.

The spatial pattern of distribution of multiple cropped areas, reveals a wide range of variation from one state to another in the extent of intensification of ploughing. In fact the intensification of farming depends, to a large extent, on such factors as physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. In the three states of Punjab, Haryana and West Bengal, intensification of cropping is very high i.e. more than 70 percent. Among these Punjab tops the list of all states in India with 91.53 percent of net sown area. This trend in Haryana and Punjab hardly needs explanation as these are the celebrated green revolution states, while, West Bengal owe its intensification to subsistence nature of agriculture better called 'oriental agriculture' where pressure on land is tremendous. People, there cannot afford to have fallow land. While, Meghalaya, Tamil Nadu, Karnataka, Gujarat, Nagaland and Mizoram have very less intensification of cropping i.e. less than 20 percent. The factors mentioned earlier like, physiography or relief, soil type, amount and seasonal distributional of rainfall, availability of irrigation facilities, use of fertilizers etc. are responsible behind the dismal performance in these states. One or more of these factors are constantly keeping the intensity very low.The changes in area sown more than once indicate that, while most

of states have achieved positive growth, the two states of Kerala and Tamil Nadu and Bihar have shown no growth. A majority of states like, Manipur, Nagaland, Maharashtra, Rajasthan, Orissa, Karnataka, Arunachal Pradesh, West Bengal, Punjab, Haryana, and Jammu & Kashmir have shown very significant increase in the cropping intensification.

There exists a wide range of interstate variation in population pressure in India. The heterogeneity in physical attributes like physiographic, soil type and its fertility, local climate, seasonal distribution of rainfall and availability of underground water have led to wide range of variation in population distribution from one part to another. On an average, rural population density is found to be very high in the states of West Bengal, Kerala, Bihar, Uttar Pradesh, Punjab, Haryana and Assam. But the agricultural density and physiological density, which shows the pressure of population on arable land, found to be consistently high in the states of Bihar, West Bengal, Uttar Pradesh, Tamil Nadu, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura and Jammu & Kashmir.

All the states except Kerala have less than one ratio of non-agricultural workers to agricultural workers. It is interesting to note that Kerala, which has high rural and physiological density, has very low agricultural density and very high ratio of non-agricultural workers to agricultural workers (ratio is more than one). It signifies that Kerala is highly rurally-populated state but has diversified occupational structure. Punjab and Haryana, which denotes high rural density has adversely low agricultural density, signifies higher opportunity of land under plough.

In the case of changes occurred in pressure of population, it is observed that almost all the states, except Kerala, have increase in the agricultural density. But the most

profound change has been seen in Manipur, Bihar and Himachal Pradesh, Madhya Pradesh and Rajasthan where agricultural density has been found to increase almost double during last thirty years. Similarly Physiological Density is seen to be growing rapidly in Bihar, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Manipur and Rajasthan. The ratio of non-agricultural workers to agricultural workers is seen to be rising rapidly in the states where ratio is already very low but Bihar, Himachal Pradesh, Madhya Pradesh and Nagaland is seems to be indifferent in this case, where ratio is still very low.

It is seen from the previous analysis that higher proportion as net sown area corresponds to lower proportion as forest land. Similarly net sown area of total reported area is characterized with lower proportion of area under barren land. Area put to non-agricultural uses has a significant negative correlation with culturable wasteland. This relationship indicates that wasteland has been encroached for non-agricultural purposes due to increase in demands of land for roads, railways, settlements etc. Culturable wasteland has a significant positive correlation with fallow land other than current fallow. Similarly other than current fallows is showing a highly positive association with current fallow. It indicates that culturable wasteland has its origin mainly from other than current fallows and other than current fallows have its origin from current fallows.

It is noticed that net sown area has a strong positive correlation with four variables i.e. crude population density, percentage concentration of population, urbanisation and ratio of non-agricultural workers to agricultural workers. The strong correlation between and net sown area and population density implies that states with

higher pressure on land are characterised with an equally higher proportion of total reported area as net sown area. Similarly significant positive relationship of percentage population concentration with net area sown indicates that the states where population concentration is higher have higher percentage of share as net sown area. It is interesting to note that net sown area has a positive relationship with urbanisation and ratio of non-agricultural workers to total agricultural workers show. This relationship suggesting that the states, where urbanisation is higher and have more workers are engaged in non-primary sector than agricultural sector have more land for land for cultivation. There exist a negative relationship between net area sown and agriculture density. It seems that higher growth in rural population with limited scope of expansion in cultivated area, the agriculture density has increased more rapidly in the densely populated rural areas. The negative association of forestland with urbanisation indicates that urbanisation and land under forest cover is going in opposite direction. Area put to non-agricultural uses is positively associated with population density, reveals the fact that the area occupied for non-agricultural uses is increasing with the increase in population pressure. Fallow land exhibits a positive association with population concentration, indicates that population concentration has a causal relationship with fallow land. The result of stepwise regression analysis reveals that agricultural density is the most important determinant of net sown area. It is found to be followed by ratio of non-agricultural workers to agricultural workers and percentage population concentration.

About three fourth of the total population draw their livelihood from agriculture, but it is evident that the land sector can not bear the burden of growing population pressure, not withstanding the untapped potential for agricultural production

in many regions. Therefore, there is a felt need for both horizontal and vertical diversification of agricultural economics. This is particularly so because all lands and location are not equally suitable for profitable, alternative farming and hence, there is need for cluster approach to development. It is suggested that due to both population growth and urbanization, there is growing demand for conversion of agricultural lands to non-agricultural uses. It is therefore, important to develop a long term perspective plan on type of land to be allocated for urbanization and industrialization in various regions. Unplanned industrialization programme tended to affect the land use planning and food security situation, so the plan of land use should be made for efficient use of land resources and there is need for checking any indiscriminate use of land resources that pose threat to sustainability of livelihood system of the people.

# APPENDIX 1

## Concept and Definition of Land use categories

Forest: Forest includes all land classed as forest under any legal enactment dealing with forests or administration as forests, whether state owned or private and whether wooded or maintained as potential forestland. The area of crops rose in the forests and grazing land or the area open for grazing within the forests should remain included under the forest area.

The land under non-agricultural use: This category included all lands occupied by buildings, roads and railways or under water e.g. rivers and canals and other lands put to uses other than agricultural.

Barren and uncultivated land: This category covers all barren and uncultivable land, including mountains, desert etc. which can not be brought under cultivation, except at a high cost, and is classified as uncultivable, whether such land is in isolated blocks within cultivated holding.

Permanent pasture and other grazing land: This category covers all grazing lands whether they are permanent pasture or meadows or not. Village commons and grazing land are included under this category.

Miscellaneous tree crops and groves: Under this category is included all cultivated land, which is not included under the net area sown, but is put to some agricultural use. Land under casuarinas trees, thatching grass, bamboo bushes and other groves for fuel etc., which are not included under 'orchards', are classed under this category.

Culturable wasteland: This category includes all land available for cultivation, whether taken up for cultivation or not taken up for cultivation once, but not cultivated during the

current years and the last five years or more in succession. Such land may be either fallow or covered with shrubs and jungles, which are not put to any use. They may be assessed or unassisted and may lie in isolated blocks or within cultivated holding. Land once cultivated, but not cultivated for five years in succession, shall also be included in this category after five years.

Current fallow: this category comprises cropped area, which is kept fallow during the current years only. For example, if any seedling area is not cropped again in the same year, it may be treated as current fallow.

Other fallow land: This category includes all lands, which were taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years. The reason for keeping such lands fallow may be one of the following property of the cultivators.

a) Inadequate supply of water.

b) Malarias climate.

c) Silting of canals and rivers, and

d) Un-remunerative nature of farming.

Net area sown: This term denote the net area sown under crops and orchards, counting area sown more than once in the same year only once.

Area Sown More than once: This represent the area on which crops is cultivated more than once during the agricultural year. This is obtained by deducting 'net area sown from 'total cropped Area.

# Bibliography

**Primary Source:**


Govt. of India, "*Census of India, 1971, Pt.I.A, General Population Table*".

Govt. of India, "*Census of India, 1981, Pt.I.A, General population table*".

Govt. of India, "*Census of India, 1991, Pt.I.A, General population table*".

Govt. of India, "*Census of India, 2001, Paper I, Provisional population table*".

Govt. of India, "*Census of India, 2001, Paper III, Provisional population table*".

Govt. of India, "*Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1971*".

Govt. of India, "*Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1981*".

Govt. of India, "*Census of India, Union Primary Census Abstract, Series I, Part II B (i), 1991*".

Govt. of India, "*Indian Agriculture Statistics, Vol. I, 1989-90 and 1990-91, Directorate of Economics and Statistics, Ministry of Food, & Agriculture*".

Govt. of India, "*Indian Agriculture Statistics, Vol.I, 1969-70 and 1970-71*", Directorate of Economics and Statistics, Ministry of Food, & Agriculture.

Govt. of India, "*Indian Agriculture Statistics, Vol.I, 1979-80 and 1980-81*", Directorate of Economics and Statistics, Ministry of Food, & Agriculture.

Govt. of India, "*Land Use Statistics at a glance, 1998-99*". , Directorate of Economics and Statistics, Ministry of Food & Agriculture.

**Secondary Source:**


Ahamad, E.(1954), *Geographical Essay on India*, Patna, pp15-16.

Bagchi, J. (1981), *"Population Pressure and agricultural Ghange,"* in Noor Mohammad (ed.), Perspectives in Agricultural Geography, Concept Publishing Company, New Delhi, vol.5, pp. 45 – 54.

Bhattacharya, Kamal, *"Agriculture Land Use in Barddhaman Block, Barddhaman District"*, Geographical Review of India, vol. 64 (march 2002), pp 69-71.

Boserup, E (1965), *"The Condition of agricultural Growth: The Economics of Agrarian Change under Population Pressure,"* London, Allen and Unwin.

Carr – Saunders, A.(1976): *Some aspect of Population Problem"*, Geography 18, 202-4.

Clark, C. (1986), *"Population Growth and land Use"*, London: Macmillan.

Das, D.M. (1976), *"Population Pressure and intensity of Cropping in Assam,"* Geographical Review of India, vol. 41, pp. 1-12.

Das, K.K.L. and Das, K.N. (1981), *"Agricultural Land Use and the Pressure of Population in North Bihar Plain West of the Kosi River,"* in Noor Mohammad (ed.), Perspective in Agricultural Geography (New Delhi: Concept Publishing Company), vol. 5, pp. 55-80.

Daya Ram: *"Land Use in Haryana: Past, Present and Future*, Geographical Review of India", vol. 64 (2) (June 2002), pp 148-56.

Duby, R.S.: *"Population Pressure and Agrarian Change"*, Rawat Publication, 1990, pp 50-62.

Easterlin, R.A.(1969), *"Relations between Population Pressure and Demographic Change,"* International Population Conference, London, 1969. Liege: International Population Conference, London, 1969. Liege: International Union for the Scientific Study of Population, 3, 1961-85.

Friedlander, D. (1969), *"Demographic Response and Population Change,"* Demography, 6, 369-81.

Ghose Kamal Kumar and Khan, Dilip Kumar, *"Land Use Pattern in Bankura District- A Factor Analysis Approach"*, Indian Journal of Regional Science, vol. 24, no. 1, 2002, pp 98-102.

Grigg, D. (1966), *"Population Growth and Agrarian Change,"* in Progress in Geography, 8, pp. 134 – 76.

Gupta B.S.; Saraswat P.K. and Purohit M.L., *"Changing Pattern of Land Use and its Efficiency in Arid Zone of Rajasthan"*, National Geographical Journal of India, vol. 44 (Mar-Dec 1998), pp 236-240.

Mahmood, Aslam ( 1998), *"Statistical Methods in Geographical Studies"* (New Delhi: Rajesh Publications).

Mishra, S.N. (1969), *"Land Use in the Khadar and Ravine Tract of the Lower Middle Gomati Vally"*, National Geographical Journal of India, vol. 10, nos 3 and 4.

Pandey, V.K. and Tiwari, S.K.: *"Regional agriculture land use"*, Indian Journal of Agriculture Economics, vol. 51(1-2), (Jan-June1996), pp 260-269.

Rao,K.S. and Nandy.S.N, *"Land use pattern and population pressure in Uttaranchal"*, ENVIS Bulletin: Himalayan Ecology & Development. Vol. 9,No.1, 2001. pp. 24-32.

Ray Chaudhry, S.P., *"Extention of Cultivation Area for increased Agricultural Production"*, Proceeding of Symposium on Science and India's Food Problem, I.C.A.R. Publication, 1977, pp. 161-63.

Reddy, V .Ratna, *"Under Utilisation of Land in Andhra Pradesh: Extent and Determinants"*, Indian Journal of Agricultural Economics, vol. 46, no. 4, Oct-Dec. 1991. pp 555-567.

Sen, Jyotirmoy, *"Land Utilisation and Population Distribution: A Case Study of West Bengal (1850-1985),"* Daya Publishing House, 1988, pp 1-204.

Shafi, M. (1972), *"Land Utilisation in Eastern Uttar Pradesh"*, Aligarh Muslim University, Aligarh.

Sharma, Parsu R.: *"Spatial Characteristics of Land use and its Efficiency: An Evaluation (A case study of Chhatisgarh region)"*, National Geographer, vol. XIII, no. 1 (June 1978), pp 81-89.

Singh V.R.: *"Land use pattern in Mirzapur and Environs"*, Banaras Hindu University, 1970, pp 49-62.

Singh, R.L. (1989), *"India: A regional Geography"* (Varansi: National Geographical Society of India).

Singh, Ravi, S., *"Land Use and Levels of Agricultural Development in Arunachal Pradesh"*, National Geographical Journal of India, vol 46(1-4), mac-dec.,2000: pp 69-80

T.R. Maltus,(1970), *"A summary view of principle of population"*, in G.J.Demoko, et al (eds.) Population Geography: A Reader. New York; McGraw-Hill, pp.44-70.

Tiwari, P.C. and Joshi Bhagwati, *"optimal Land Use in Mountains for Sustainable Development: a Case study of Himalya-Ganga Plain"*, National Geographical Journal of India, vol 46 (1-4), Mar-Dec, 2000; pp 81-92

Yadav, Hridai, Ram (1986); *"Genesis and Utilisation of Waste lands,"* Concept Publishing Company, New Delhi, pp 1-239.

Yajima, J. (1985), *"The Effect of Population Pressure and Seasonal Labour Surplus on the Pattern and Intensity of Agriculture,"* Proceedings of World Population Conference (New York: United Nations), 3, pp. 429-33.